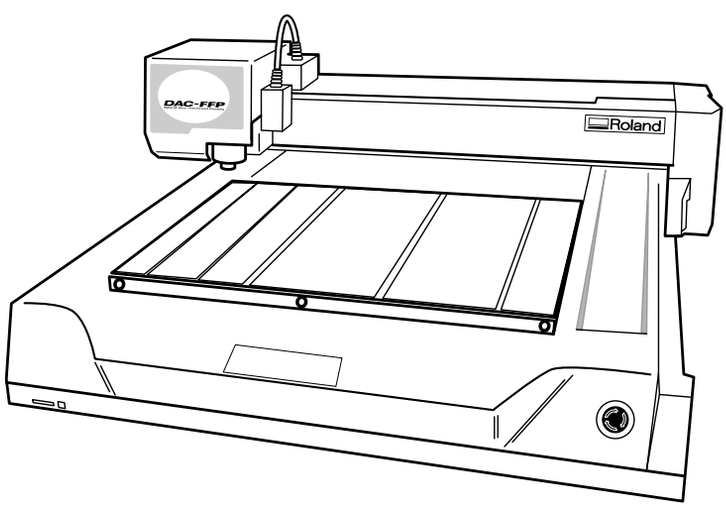
EGX-600
EGX-400

Engraving Machine by Roland DG Corporation

User's Manual



Thank you very much for purchasing the product.

- To ensure correct and safe usage with a full understanding of this product's performance, please be sure to read through this manual completely and store it in a safe location.
- Unauthorized copying or transferral, in whole or in part, of this manual is prohibited.
- The contents of this operation manual and the specifications of this product are subject to change without notice.
- The operation manual and the product have been prepared and tested as much as possible. If you find any misprint or error, please inform us.
- Roland DG Corp. assumes no responsibility for any direct or indirect loss or damage which may occur through use of this product, regardless of any failure to perform on the part of this product.
- Roland DG Corp. assumes no responsibility for any direct or indirect loss or damage which may occur with respect to any article made using this product.

Roland DG Corporation

For the USA

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

NOTE:
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Unauthorized changes or modification to this system can void the users authority to operate this equipment.

Use only I/O cables that have been designed and manufactured specifically for this device.

For Canada

NOTICE

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

AVIS

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

For California

WARNING

This product contains chemicals known to cause cancer, birth defects and other reproductive harm.

For EU Countries

CE

Manufacturer:
ROLAND DG CORPORATION
1-6-4 Shinmiyakoda, Kita-ku, Hamamatsu-shi, Shizuoka-ken, 431-2103 JAPAN

The authorized representative in the EU:
Roland DG Corporation, German Office Halskestrasse 7, 47877 Willich, Germany

For EU Countries

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Roland DG Corp. has licensed the MMP technology from the TPL Group.

GENERAL SAFETY RULES

WARNING ! Read and understand all instructions. Failure to follow all instructions listed below, may result in electric shock, fire and/or serious personal injury.

SAVE THESE INSTRUCTIONS.

Work Area

Keep your work area clean and well lit. Cluttered benches and dark areas invite accidents.

Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust. Power tools create sparks which may ignite the dust or fumes.

Keep bystanders, children, and visitors away while operating a power tool. Distractions can cause you to lose control.

Electrical Safety

Grounded tools must be plugged into an outlet properly installed and grounded in accordance with all codes and ordinances. Never remove the grounding prong or modify the plug in any way. Do not use any adaptor plugs. Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded. If the tools should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.

Avoid body contact with grounded surfaces such as pipes, radiators, ranges and refrigerators. There is an increased risk of electric shock if your body is grounded.

Don't expose power tools to rain or wet conditions. Water entering a power tool will increase the risk of electric shock.

Do not abuse the cord. Never use the cord to carry the tools or pull the plug from an outlet. Keep cord away from heat, oil, sharp edges or moving parts. Replace damaged cords immediately. Damaged cords increase the risk of electric shock.

When operating a power tool outside, use an outdoor extension cord marked "W-A" or "W." These cords are rated for outdoor use and reduce the risk of electric shock.

Personal Safety

Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use tool while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.

Dress properly. Do not wear loose clothing or jewelry. Contain long hair. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewelry, or long hair can be caught in moving parts.

Avoid accidental starting. Be sure switch is off before plugging in. Carrying tools with your finger on the switch or plugging in tools that have the switch on invites accidents.

Remove adjusting keys or switches before turning the tool on. A wrench or a key that is left attached to a rotating part of the tool may result in personal injury.

Do not overreach. Keep proper footing and balance at all times. Proper footing and balance enables better control of the tool in unexpected situations.

Use safety equipment. Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.

Tool Use and Care

Use clamps or other practical way to secure and support the workpiece to a stable platform. Holding the work by hand or against your body is unstable and may lead to loss of control.

Do not force tool. Use the correct tool for your application. The correct tool will do the job better and safer at the rate for which it is designed.

Do not use tool if switch does not turn it on or off. Any tool that cannot be controlled with the switch is dangerous and must be repaired.

Disconnect the plug from the power source before making any adjustments, changing accessories, or storing the tool. Such preventive safety measures reduce the risk of starting the tool accidentally.

Store idle tools out of reach of children and other untrained persons. Tools are dangerous in the hands of untrained users.

Maintain tools with care. Keep cutting tools sharp and clean. Properly maintained tools, with sharp cutting edges are less likely to bind and are easier to control.

Check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the tools operation. If damaged, have the tool serviced before using. Many accidents are caused by poorly maintained tools.

Use only accessories that are recommended by the manufacturer for your model. Accessories that may be suitable for one tool, may become hazardous when used on another tool.

SERVICE

Tool service must be performed only by qualified repair personnel. Service or maintenance performed by unqualified personnel could result in a risk of injury.

When servicing a tool, use only identical replacement parts. Follow instructions in the Maintenance section of this manual. Use of unauthorized parts or failure to follow Maintenance Instructions may create a risk or electric shock or injury.

RÉGLES DE SÉCURITÉ GÉNÉRALES

AVERTISSEMENT ! Vous devez lire et comprendre toutes les instructions. Le non-respect, même partiel, des instructions ci-après entraîne un risque de choc électrique, d'incendie et/ou de blessures graves.

CONSERVEZ CES INSTRUCTIONS

Aire de travail

Veillez à ce que l'aire de travail soit propre et bien éclairée. Le désordre et le manque de lumière favorisent les accidents.

N'utilisez pas d'outils électriques dans une atmosphère explosive, par exemple en présence de liquides, de gaz ou de poussières inflammables. Les outils électriques créent des étincelles qui pourraient enflammer les poussières ou les vapeurs.

Tenez à distance les curieux, les enfants et les visiteurs pendant que vous travaillez avec un outil électrique. Ils pourraient vous distraire et vous faire une fausse manoeuvre.

Sécurité électrique

Les outils mis à la terre doivent être branchés dans une prise de courant correctement installée et mise à la terre conformément à tous les codes et réglements pertinents. Ne modifiez jamais la fiche de quelque façon que ce soit, par exemple en enlevant la broche de mise à la terre. N'utilisez pas d'adaptateur de fiche. Si vous n'êtes pas certain que la prise de courant est correctement mise à la terre, adressez-vous à un électricien qualifié. En cas de défaillance ou de défectuosité électrique de l'outil, une mise à la terre offre un trajet de faible résistance à l'électricité qui autrement risquerait de traverser l'utilisateur.

Évitez tout contact corporel avec des surfaces mises à la terre (tuyauterie, radiateurs, cuisinières, réfrigérateurs, etc.). Le risque de choc électrique est plus grand si votre corps est en contact avec la terre.

N'exposez pas les outils électriques à la pluie ou à l'eau. La présence d'eau dans un outil électrique augmente le risque de choc électrique.

Ne maltraitez pas le cordon. Ne transportez pas l'outil par son cordon et ne débranchez pas la fiche en tirant sur le cordon. N'exposez pas le cordon à la chaleur, à des huiles, à des arêtes vives ou à des pièces en mouvement. Remplacez immédiatement un cordon endommagé. Un cordon endommagé augmente le risque de choc électrique.

Lorsque vous utilisez un outil électrique à l'extérieur, employez un prolongateur pour l'extérieur marqué "W-A" ou "W". Ces cordons sont faits pour êntre utilisés à l'extérieur et réduisent le risque de choc électrique.

Sécurité des personnes

Restez alerte, concentrez-vous sur votre travail et faites preuve de jugement. N'utilisez pas un outil électrique si vous êtes fatigué ou sous l'influence de drogues, d'alcool ou de médicaments. Un instant d'inattention suffit pour entraîner des blessures graves.

Habillez-vous convenablement. Ne portez ni vêtements flottants ni bijoux. Confinez les cheveux longs. N'approchez jamais les cheveux, les vêtements ou les gants des pièces en mouvement. Des vêtements flottants, des bijoux ou des cheveux longs risquent d'être happés par des pièces en mouvement.

Méfiez-vous d'un démarrage accidentel. Avant de brancher l'outil, assurez-vous que son interrupteur est sur ARRÈT. Le fait de transporter un outil avec le doigt sur la détente ou de brancher un outil dont l'interrupteur est en position MARCHE peut mener tout droit à un accident.

Enlevez les clés de réglage ou de serrage avant de démarrer l'outil. Une clé laissée dans une pièce tournante de l'outil peut provoquer des blessures.

Ne vous penchez pas trop en avant. Maintenez un bon appui et restez en équilibre en tout temps. Un bonne stabilité vous permet de mieux réagir à une situation inattendue.

Utilisez des accessoires de sécurité. Portez toujours des lunettes ou une visière. Selon les conditions, portez aussi un masque antipoussière, des bottes de sécurité antidérapantes, un casque protecteur et/ou un appareil antibruit.

Utilisation et entretien des outils

Immobilisez le matériau sur une surface stable au moyen de brides ou de toute autre façon adéquate. Le lait de tenir la pièce avec la main ou contre votre corps offre une stabilité insuffisante et peut amener un dérapage de l'outil.

Ne forcez pas l'outil. Utilisez l'outil approprié à la tâche. L'outil correct fonctionne mieux et de façon plus sécuritaire. Respectez aussi la vitesse de travail qui lui est propre.

N'utilisez pas un outil si son interrupteur est bloqué. Un outil que vous ne pouvez pas commander par son interrupteur est dangereux et doit être réparé.

Débranchez la fiche de l'outil avant d'effectuer un réglage, de changer d'accessoire ou de ranger l'outil. De telles mesures préventives de sécurité réduisent le risque de démarrage accidentel de l'outil.

Rangez les outils hors de la portée des enfants et d'autres personnes inexpérimentées. Les outils sont dangereux dans les mains d'utilisateurs novices.

Prenez soin de bien entretenir les outils. Les outils de coupe doivent être toujours bien affûtés et propres. Des outils bien entretenus, dont les arêtes sont bien tranchantes, sont moins susceptibles de coincer et plus faciles à diriger.

Soyez attentif à tout désalignement ou coincement des pièces en mouvement, à tout bris ou à toute autre condition préjudiciable au bon fonctionnement de l'outil. Si vous constatez qu'un outil est endommagé, faites-le réparer avant de vous en servir. De nombreux accidents sont causés par des outils en mauvais état.

N'utilisez que des accessoires que le fabricant recommande pour votre modèle d'outil. Certains accessoires peuvent convenir à un outil, mais être dangereux avec un autre.

RÉPARATION

La réparation des outils électriques doit être confiée à un réparateur qualifié. L'entretien ou la réparation d'un outil électrique par un amateur peut avoir des conséquences graves.

Pour la réparation d'un outil, n'employez que des pièces de rechange d'origine. Suivez les directives données à la section "Réparation" de ce manuel. L'emploi de pièces non autorisées ou le non-respect des instructions d'entretien peut créer un risque de choc électrique ou de blessures.

Contents

Contents 1
About the Documentation for This Machine 4
Documentation Included with the Machine 4
Viewing Manuals in Electronic Format 5

⚠ To Ensure Safe Use 6

About the Labels Affixed to the Unit 10

⚠ Pour utiliser en toute sécurité 11

À propos des étiquettes collées sur l'appareil 15

Chapter 1 Getting Started 17

1-1 Including Items and Accessories 18
1-2 Names and Functions 19
1-3 Installation and Cable Connections 21
Instllation Site and Operating Environment 21
Connecting the Cables 22

Chapter 2 Basic Operation 25

2-1 Emergency Stop to Ensure Safety 26
How to Perform an Emergency Stop 26
To Cancel an Emergency Stop 26
Opening and Closing the Spindle Cover 26
2-2 Switching the Power On and Off 27
Switching On the Power 27
Switching Off the Power 27
2-3 Moving the Spindle Head 28
Moving the Spindle Head 28
Moving the Spindle Head Out of the Way Quickly 29
2-4 Starting and Stopping Spindle Rotation 30
Using Buttons to Start and Stop Rotation 30
Adjusting the Spindle Rotating Speed 30
Forced Stop of Spindle Rotation 31
2-5 Menu Operations 32
Displaying the Menus 32
Basic Menu Operations 32
2-6 Care and Handling of Memory Cards 33
Types of Memory Cards You Can Use 33
Memory-card Writers You Can Use 33
Inserting and Removing a Memory Card 34
Formatting a Memory Card 36

Chapter 3 Preparations 37

3-1 Selecting the Cutter Installation Method 38
Cutter Types and What They Are Suited For 38
3-2 Cutter Installation Method 1 (With Nose Unit) 39
Installing a Character Cutter (With Nose Unit) 40
Cutting Parameters When Using the Nose Unit 43
3-3 Cutter Installation Method 2 (No Nose Unit) 44
Installing a Character Cutter (With No Nose Unit) 45
3-4 Cutter Installation Method 3 (Diamond Scraper) 48
Installing a Diamond Scraper 49
Cutting Parameters for the Diamond Scraper 52

3-5 Cutter Installation Method 4 (End Mill) 53
Installing an End Mill 54
3-6 Loading Material and Setting the Reference Point for Cutting 57
Loading Material 57
The Loaded Position of the Workpiece 58
Setting the Reference Point for the Cutting Position 58

Chapter 4 Performing CuttingUsing a Computer 59

4-1 Procedures for Performing Cutting Using a Computer 60
4-2 Setting the Cutting Parameters 61
Types of Cutting Parameters 61
Differences in Setting Items Between Programs 61
Making the Settings on the Machine 62
4-3 Installation and Overview of the Included Software 64
Software Included with the Machine 64
Installation and Setup 64
4-4 Executing Cutting Data Saved on a Memory Card 67
Working with Cutting Data on a Memory Card 67
Requirements for Saving Cutting Data 67
Saving Cutting Data 68
Importing and Executing Memory-card Data 71
Important Notes When Saving Cutting Data 72

Chapter 5 The TeachingFeature 73

5-1 Overview of the Teaching Feature 74
What Is the Teaching Feature? 74
Important Notes When Using the Nose Unit 74
5-2 Basic Steps for Creating and Executing a Sequence 75
Step 1 Decide on the Mode of Operation and the Origin Points 75
Step 2 Create the Sequence 76
Step 3 Save the Sequence 78
Step 4 Execute the Sequence 78
5-3 Correcting a Sequence 79
If You Make a Mistake in Input 79
Revising a Saved Sequence 81
5-4 Detailed Description of the Sequence Editing Screen 82
Screen Layout and Button Operations 82
Setting a Label 83
5-5 Detailed Information on Saving a Sequence 84
Destinations for Saving Sequences 84
Backing Up a Sequence 85
Deleting a Sequence 86
5-6 Coordinate Systems Used with the Teaching Feature 87
Cutting Positions Used with the Teaching Feature 87
Optional Origins 87
I Level and R Level 88
5-7 List of Commands 89
5-8 Sample Sequences 100
Example of a Sequence Using Optional Origins 100

Chapter 6Detailed Description of Functions 103

6-1 Coordinate Systems and Origin Points 104
Workpiece Coordinates and Machine Coordinates 104
The Machine's Workpiece Origin Point 104
Unit of Measurement for Coordinate Values 104

6-2 Detailed Description of the Nose Unit 105
Amount of Height Displacement That Can Be Tracked 105
Limitations on Cutting 105
6-3 Menu Flowchart 106
6-4 Detailed Description of the Menus 110
Main Menu 110
[I/O] Submenu 111
[OTHERS] Submenu 112
[SELF] Submenu 113
Teaching Menu 114
[RUN] Submenu 116
X/Y-axis Origin-point Setting Menu 117
Z-axis Origin-point Setting Menu 117
Pause Menu 117
Copy Menu 118
Language Menu 118
Initialize Menu 118

Chapter 7 Maintenance 119

7-1 Daily Care 120
7-2 Maintenance and Inspection 122
Spindle Maintenance 122
Maintenance of the Z-axis Screw 122

Chapter 8 Troubleshooting 123

8-1 Problems with Engraving 124
8-2 Problems with Operation 126
8-3 Responding to an Error Message 128

Chapter 9 Appendix 133

9-1 Examples of Settings for Cutting Parameters 134
Sample Settings for Engraving 134
Tips for Fine-tuning 134
9-2 The Nose Unit 135
Considerations for Fluctuations in Workpiece Thickness 135
Structure of the Nose Unit 135
9-3 Optional Items 136
9-4 Dimensional Drawings 137
9-5 List of Supported Commands 138
RML-1 Commands 138
Device Control Commands 140
9-6 Specifications 141
Main Unit Specifications 141
Interface Specifications 142

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http://www.rolanddg.com/

About the Documentation for This Machine

Documentation Included with the Machine

User's Manual (this manual)
This describes important notes for ensuring safe use, and explains how to install the machine and how to install and set up the included programs. Be sure to read it first.
It does not describe how to operate your computer or how to use the programs.

Dr. Engrave User's Manual (electronic-format manual)
This manual explains how to use the included engraving program. It describes procedures ranging from how to design a nameplate or the like to engraving operations. Read it if you're using this program.
The manual is in electronic format, and no printed document is included. You can find it on the included Roland Software Package CD-ROM.

3D Engrave User's Manual (electronic-format manual)
This manual explains how to use the included program for three-dimensional engraving and for creating reliefs. It describes procedures ranging from how to design reliefs and the like to cutting operations. Read it if you're using this program.
The manual is in electronic format, and no printed document is included. You can find it on the included Roland Software Package CD-ROM.

Cutting Tips (electronic-format manual)
This is a collection of hints and tips for the procedures of three-dimensional cutting. Read it as a reference when you're cutting three-dimensional objects.
Like the other manuals in electronic format, it is a PDF document, and Acrobat Reader is required to view it. You can find it on the Roland Software Package CD-ROM, inside [Document], in the [Cuttips] folder.

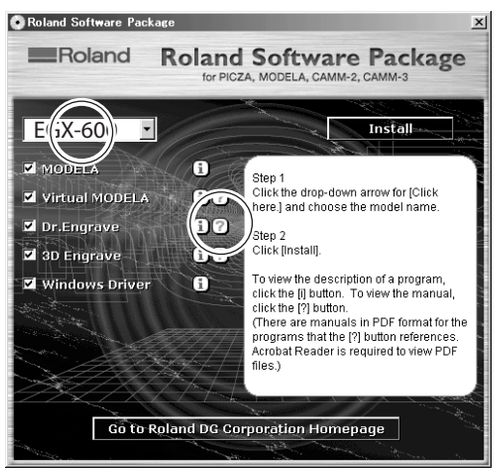
Other Information
For descriptions of other programs and drivers, refer to the online help.

Viewing Manuals in Electronic Format

You can view the manuals in electronic format on a computer running Windows (Windows 95 or later).

Procedures for Viewing Manuals in Electronic Format

1. Place the Roland Software Package in the CD-ROM drive. The menu screen appears automatically.
2. Click the [Click here] message, then choose the name of the model you're using (EGX-600 or EGX-400).
3. Click the [?] button. Acrobat Reader starts and the user's manual is displayed.
   When you click the button for the first time, the program for installing and setting up Acrobat Reader may start. Follow the on-screen instructions to proceed with installation and setup.
4. You can use the left and right arrow keys on the computer keyboard to advance to the next page or go back to the previous page.
   You can also do the same thing using the [◀] and [▶] buttons on screen.


Roland Software Package
Roland
Roland Software Package
for PICZA, MODELA, CAMM-2, CAMM-3
Install
MODELA
Virtual MODELA
Dr.Engrave
3D Engrave
Windows Driver
Step 1
Click the drop-down arrow for [Click here.] and choose the model name.
Step 2
Click [Install].
To view the description of a program, click the [i] button. To view the manual, click the [?] button.
(There are manuals in PDF format for the programs that the [?] button references. Acrobat Reader is required to view PDF files.)
Go to Roland DG Corporation Homepage

Point

About Adobe Acrobat Reader

Acrobat Reader is a program required to view files in PDF format. Installing and setting up Acrobat Reader 4.0, found on the included CD-ROM, lets you view the manual easily on any computer. Acrobat Reader 4.0 is available in versions for Windows 95 or later.

* Acrobat Reader is a product of Adobe Systems Incorporated. For detailed information on how to use it, go to the Acrobat Reader menu and select [Help] to view the online help.

⚠ To Ensure Safe Use

About ⚠ WARNING and ⚠ CAUTION Notices

⚠ WARNING	Used for instructions intended to alert the user to the risk of death or severe injury should the unit be used improperly.
⚠ CAUTION	Used for instructions intended to alert the user to the risk of injury or material damage should the unit be used improperly. * Material damage refers to damage or other adverse effects caused with respect to the home and all its furnishings, as well to domestic animals or pets.

About the Symbols

	The △ symbol alerts the user to important instructions or warnings. The specific meaning of the symbol is determined by the design contained within the triangle. The symbol at left means "danger of electrocution."
	The ⃠ symbol alerts the user to items that must never be carried out (are forbidden). The specific thing that must not be done is indicated by the design contained within the circle. The symbol at left means the unit must never be disassembled.
	The ● symbol alerts the user to things that must be carried out. The specific thing that must be done is indicated by the design contained within the circle. The symbol at left means the power-cord plug must be unplugged from the outlet.

⚠WARNING

Do not disassemble, repair, or modify.
Doing so may lead to fire or abnormal operation resulting in injury.

Do not use with any electrical power supply that does not meet the ratings displayed on the unit.
Use with any other power supply may lead to fire or electrocution.

Use only with the power cord included with this product.
Use with other than the included power cord may lead to fire or electrocution.

⚠WARNING

Ground the unit with the ground wire.
Failure to do so may result in risk of electrocution in the event of a mechanical problem.

Do not use while in an abnormal state (i.e., emitting smoke, burning odor, unusual noise, or the like).
Doing so may result in fire or electrocution. Immediately switch off the power, unplug the power cord from the electrical outlet, and contact your authorized Roland DG Corp. dealer or service center.

⚠CAUTION

Do not use with a damaged power cord or plug, or with a loose electrical outlet.
Doing so may lead to fire, electrical shock, or electrocution.

When not in use for extended periods, unplug the power-cord plug from the electrical outlet.
Failure to do so may result in danger of electrical shock, electrocution, or fire due to deterioration of electrical insulation.

Do not attempt to unplug the power-cord plug with wet hands.
Doing so may result in electrical shock or electrocution.

Install on a stable surface.
Failure to do so may result in the unit tipping over, leading to injury.

When you're finished, wash your hands to rinse away all cuttings.

⚠CAUTION

Do not damage or modify the electrical power cord, subject it to excessive bending, twisting, pulling, binding, or pinching, or place any object or weight on it.
Doing so may damage the electrical power cord, leading to fire, electrical shock, or electrocution.

When unplugging the electrical power cord from the power outlet, grasp the plug, not the cord.
Unplugging by pulling the cord may damage it, leading to fire, electrical shock, or electrocution.

Do not allow liquids, metal objects or flammables inside the machine.
Such materials can cause fire.

Perform dry cutting with no cutting oil.
Such materials can cause fire.

Please use a vacuum cleaner to remove cutting dust.Do not use any blower like airbrush.
Otherwise, dust spread in the air may harm your health.

⚠CAUTION

Use a commercially available brush to remove metal cuttings.
Attempting to use a vacuum cleaner to take up metal cuttings may cause fire in the vacuum cleaner.

Do not carelessly insert the hands while in operation.
Doing so may result in injury.

Do not touch the tip of the blade with your fingers.
Doing so may result in injury.

Wear dust goggles and mask during use.
Cutting dust may vcatter, causing bodily injury.

Do not wear gloves, a necktie or wide-sleeved clothing.
They may become caught in the tool, resulting in injury.

Do not operate if a spindle cover is cracked or broken.
If the spindle is cracked, contact a service agent immediately for repairs.

⚠CAUTION

Unpacking, installation, and moving are operations that must be carried out by four or more persons.
Failure to do so may result in falling of the unit, leading to injury.

Fasten the spindle, tool, and material securely in place.
Otherwise they may come loose during cutting, resulting in injury.

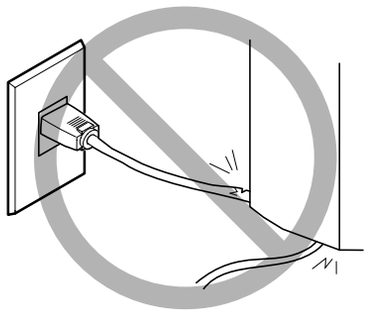
Do not operate beyond capacity or subject the tool to undue force.
The tool may break or fly off in a random direction. If cutting beyond capacity is mistakenly started, immediately turn off the EMERGENCY STOP switch.

Switch off the machine and unplug the power cord from the electrical outlet before performing cleaning or maintenance.
Failure to do so may result in injury or electrical shock.

Do not touch the tool immediately after cutting operating stops.
The tool may have become hot due to friction heat and may cause burns if touched.

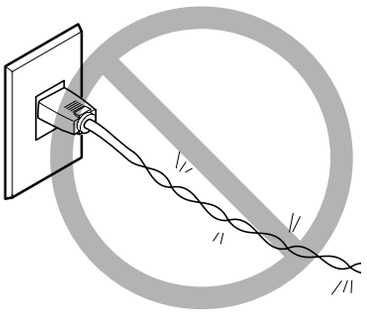
Do not touch the spindle motor immediately after a cutting operation has ended.
Doing so may result in burns.

⚠ Important notes about the power cord, plug, and electrical outlet

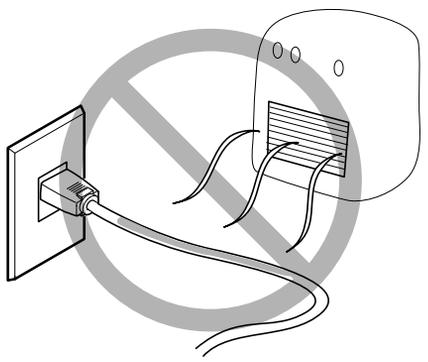


Never place any object on top or subject to damage.

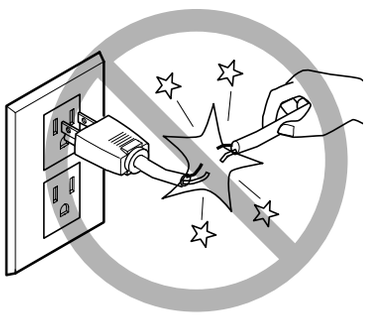
Never allow to get wet.



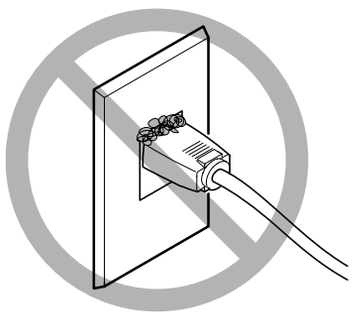
Never bend or twist with undue force.



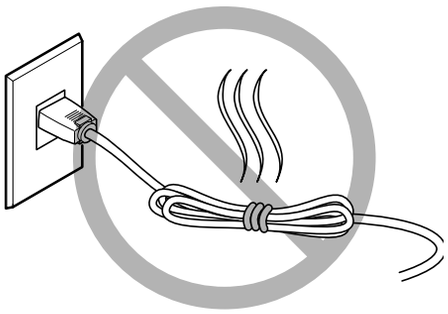
Never make hot.



Never pull with undue force.



Dust may cause fire.



Never bundle, bind, or roll up.

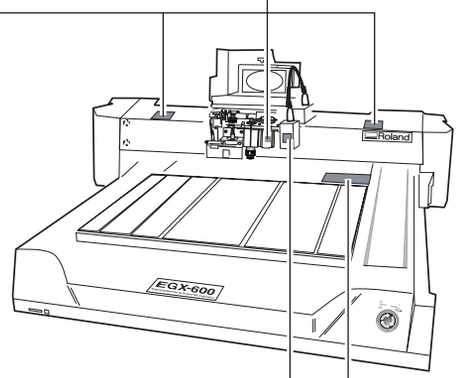
About the Labels Affixed to the Unit

These labels are affixed to the body of this product.
The following figure describes the location and content of these messages.

Caution: high temperatures. Do not touch immediately after a cutting operation has ended.

Use care to avoid being pinched. Keep hands away during operation.

Use caution when handling or working with the blade. Careless handling may result in injury.



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⚠PRECAUCION
Por favor, utilice un aspirador para limpiar la viruta y el polvo.
No utilice aire a presion para la limpieza, podria averiar la maquina, y no seria conveniente para su salud respirar el polvo.
⚠PRUDENCE
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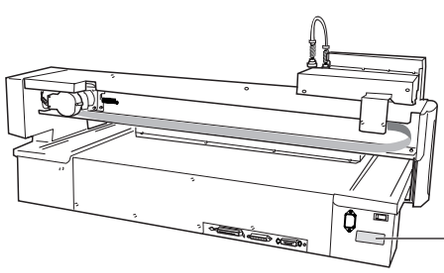
⚠VORSICHT
Bitte entfernen Sie Staub mit einem Staubsauger. Niemals ein Gebläse verwenden. Der dadurch freigesetzte Staub ist gesundheitsschädlich und kann die Funktion Ihers Geräts beeinträchtigen.
⚠CAUTELA
Usare un aspiratore per rimuovere polvere o trucioli da lavorazione.
Non usare compressori, altrimenti la polvere diffusa nell'aria potrebbere essere nociva alla salute o danneggiare la macchina.
⚠注意
切削粉は吸い込み型のクリーナーを使用して除去して下さい。
吹き飛ばすエアガンは使用しないで下さい。
切削粉が飛び散り健康の障害になったり、機器に侵入し故障の原因となります。



Model name
Rating plate
Use a rated power supply.

In addition to these symbols, the symbols shown below are also used.

Notice : Indicates information to prevent machine breakdown or malfunction and ensure correct use.

Point : Indicates a handy tip or advice regarding use.

⚠ Pour utiliser en toute sécurité

Avis sur les avertissements

⚠ ATTENTION	Utilisé pour avertir l'utilisateur d'un risque de décès ou de blessure grave en cas de mauvaise utilisation de l'appareil.
⚠ PRUDENCE	Utilisé pour avertir l'utilisateur d'un risque de blessure ou de dommage matériel en cas de mauvaise utilisation de l'appareil. * Par dommage matériel, il est entendu dommage ou tout autre effet indésirable sur la maison, tous les meubles et même les animaux domestiques

À propos des symboles

	Le symbole △ attire l'attention de l'utilisateur sur les instructions importantes ou les avertissements. Le sens précis du symbole est déterminé par le dessin à l'intérieur du triangle. Le symbole à gauche signifie "danger d'électrocution".
	Le symbole ⃠ avertit l'utilisateur de ce qu'il ne doit pas faire, ce qui est interdit. La chose spécifique à ne pas faire est indiquée par le dessin à l'intérieur du cercle. Le symbole à gauche signifie que l'appareil ne doit jamais être démonté.
	Le symbole ● prévient l'utilisateur sur ce qu'il doit faire. La chose spécifique à faire est indiquée par le dessin à l'intérieur du cercle. Le symbole à gauche signifie que le fil électrique doit être débranché de la prise.

⚠ATTENTION

Ne pas démonter, réparer ni modifier.
Démonter, réparer ou modifier l'appareil risque de provoquer un incendie ou de causer un fonctionnement anormal entraînant des blessures.

Ne pas utiliser avec une source d'alimentation électrique non conforme à la norme indiquée sur l'appareil.
Utiliser l'appareil avec une autre source d'alimentation risque de provoquer un incendie ou de causer une électrocution.

Utiliser l'appareil uniquement avec le fil électrique fourni.
Utiliser l'appareil avec un autre fil risque de provoquer un incendie ou une électrocution.

⚠ATTENTION

Mettre l'appareil à la terre avec le fil de mise à la terre.
Ne pas respecter cette consigne peut créer un risque d'électrocution en cas de panne mécanique.

Ne pas utiliser l'appareil s'il est dans un état anormal (p.ex., émission de fumée, odeur de brûlé, bruit inhabituel ou autre anomalie).
Ne pas respecter cette consigne risque de provoquer un incendie ou une électrocution.
Couper immédiatement l'alimentation électrique, débrancher le fil de la prise et communiquer avec le revendeur ou le centre de service autorisés de la société Roland DG.

⚠PRUDENCE

Ne pas utiliser si le fil ou la fiche électriques sont endommagés; ne pas brancher dans une prise mal fixée.
Négliger de suivre cette consigne risque de provoquer un incendie ou decauser une décharge électrique ou une électocution.

Si l'appareil reste inutilisé pendant de longues périodes, débrancher la fiche de la prise.
Négliger de suivre cette consigne peut créer un risque de décharge électrique ou d'électrocution ou provoquer un incendie à cause de la détérioration de l'isolant électrique.

Ne pas débrancher le fil avec des mains mouillées.
Ne pas respecter cette consigne risque de provoquer des décharges électriques ou une électrocution.

IInstaller sur une surface stable.
Sinon, l'appareil risque de se renverser et de causer des blessures.

Quand vous avez terminé d'utiliser l'appareil, laver vos mains pour bien enlever tous les copeaux.

⚠PRUDENCE

Ne pas endommager ni modifier le fil électrique. Ne pas le plier, le tordre, l'étirer, l'attacher ou le serrer de façon excessive. Ne pas placer d'objet ou de poids sur le fil.
Négliger de suivre cette consigne peut endommager le fil électrique, ce qui risque de provoquer un incendie ou de causer une décharge électrique ou une électrocution.

Pour débrancher l'appareil, saisir la fiche et non le fil électrique.
Tirer sur le fil peut l'endommager, ce qui risque de provoquer un incendie ou de causer une décharge électrique ou une électrocution.

Ne pas laisser de liquides ni d'objets métalliques ou inflammables s'infiltrer dans l'appareil.
De telles infiltrations peuvent provoquer un incendie.

Perform dry cutting with no cutting oil. Such materials can cause fire.

Utiliser un aspirateur pour nettoyer les copeaux. N'utiliser aucun appareil soufflant de l'air comme un sèche-cheveux.
La poussière répandue dans l'air pourrait nuire à votre santé.

⚠PRUDENCE

Utiliser une brosse du commerce pour retirer les rognures de métal.
Tenter de retirer les rognures de métal à l'aide d'un aspirateur peut faire naître un incendie dans l'aspirateur.

Faire attention de ne pas insérer ses mains pendant le fonctionnement.
Ne pas respecter cette consigne peut provoquer des blessures.

Ne pas toucher à l'extrémité de la lame avec vos doigts.
Vous risqueriez de vous blesser en y touchant.

Porter des lunettes de travail et un masque durant l'utilisation.
Des copeaux pourraient être projetés et vous blesser.

Ne pas porter de gants, de cravate ou de vêtement à manches amples.
Ils pourraient se prendre dans l'appareil et entraîner des blessures.

N'utilisez pas l'appareil si le couvercle de l'axe est fissuré ou brisé.
Si le couvercle de l'axe est fissuré, communiquez immédiatement avec un agent de service pour faire effectuer les réparations.

⚠PRUDENCE

Lorsque vous déplacez l'appareil, le saisir par sa base en aluminium et le transporter à 4 personnes ou plus.
Si l'appareil est saisi par la plaque du dessus, il peut tomber et entraîner des blessures.

Fixer fermement le mandrin, l'outil et le matériel à leur place.
Sinon, ces éléments risquent d'avoir du jeu lors des coupes, ce qui entraînerait des blessures.

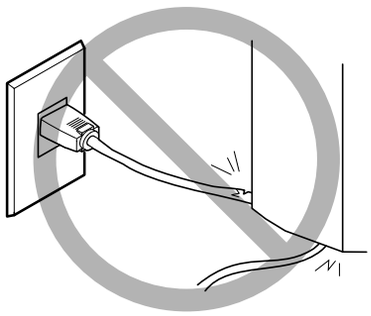
Ne pas utiliser l'appareil au-dessus de ses capacités ou le soumettre à une force excessive.
L'outil pourrait se briser ou être projeté dans une direction indéterminée. Si vous commencez par inadvertance une coupe au-dessus de la capacité de l'appareil, l'éteindre immédiatement à l'aide du bouton d'urgence.

Couper le contact et débrancher le câble d'alimentation du réceptacle avant de procéder au nettoyage ou à l'entretien de l'appareil.
Une négligence à ce niveau pourrait provoquer des blessures ou une électrocution.

Ne pas toucher l'outil immédiatement après une coupe.
L'outil pourrait avoir chauffé avec la friction et vous causer des brûlures.

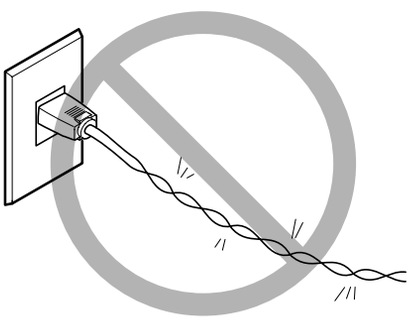
Ne touchez pas le moteur de l'axe immédiatement après avoir terminé une coupe.
Vous risqueriez alors de vous brûler.

⚠ Important notes about the power cord, plug, and electrical outlet

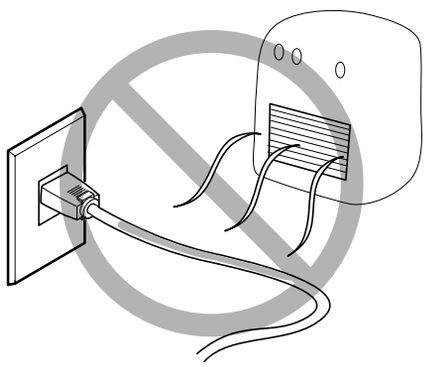


Ne jamais déposer aucun objet sur le câble, sur la fi-cheou sur la prise car cela risque de les endommager.

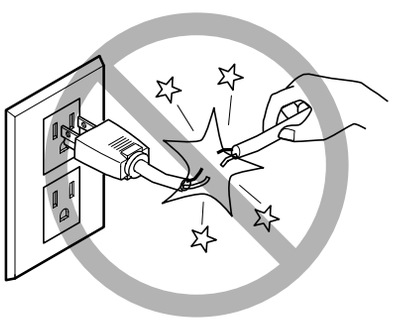
Ne jamais laisser l'eau toucher le câble, la fiche ou la prise.



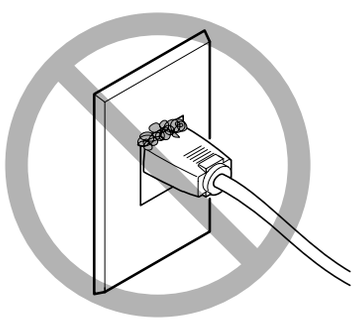
Ne jamais plier ni tordre le câble avec une force ex-cessive.



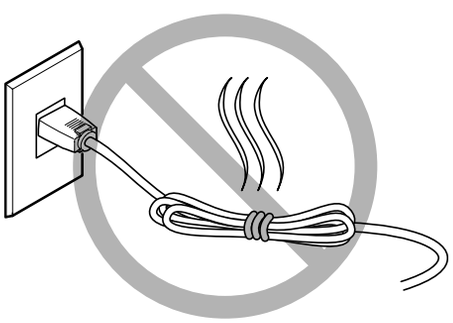
Ne jamais chauffer le câble, la fiche ou la prise.



Ne jamais tirer sur le câble ou la fiche avec une force excessive.



La poussière peut causer un incendie.



Ne jamais plier ni enrouler le câble.

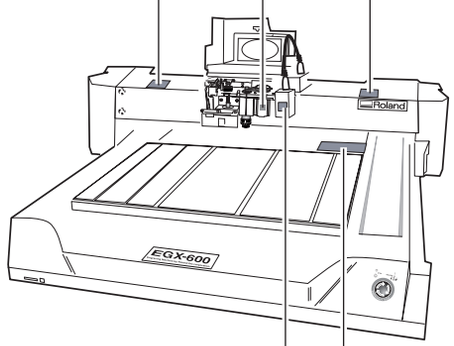
À propos des étiquettes collées sur l'appareil

Ces étiquettes sont collées à l'extérieur de l'appareil.
Les dessins suivants indiquent l'endroit et le contenu des messages.

Attention : températures élevées. Ne touchez pas immédiatement après avoir effectué une coupe.

Soyez prudent et évitez les pincements. Éloignez les mains pendant le fonctionnement.

Soyez prudent lorsque vous manipulez ou utilisez la lame, sinon vous risquez de vous blesser.



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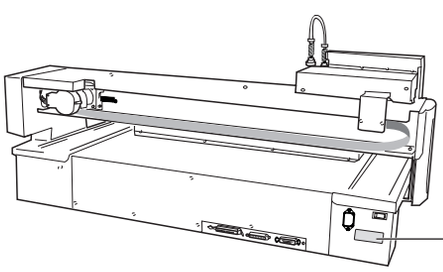


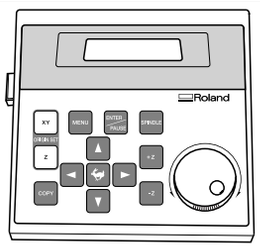
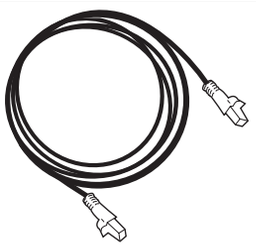
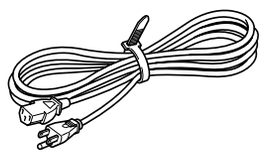
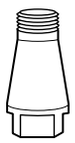
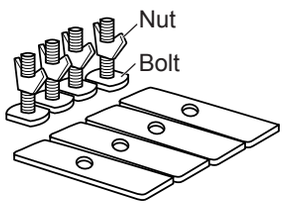
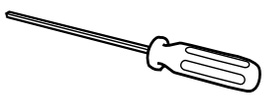
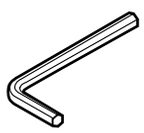
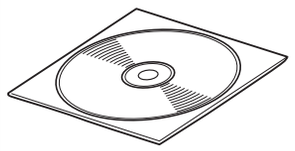
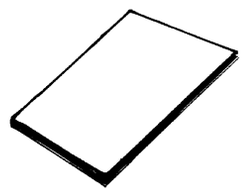
Nom du modèle
Étiquette des caractéristiques électriques
Utiliser l'alimentation appropriée

Chapter 1
Getting Started

This chapter describes the procedures extending from unpacking the machine to installing it, and also explains such matters as required terminology and other background knowledge.

1-1 Including Items and Accessories

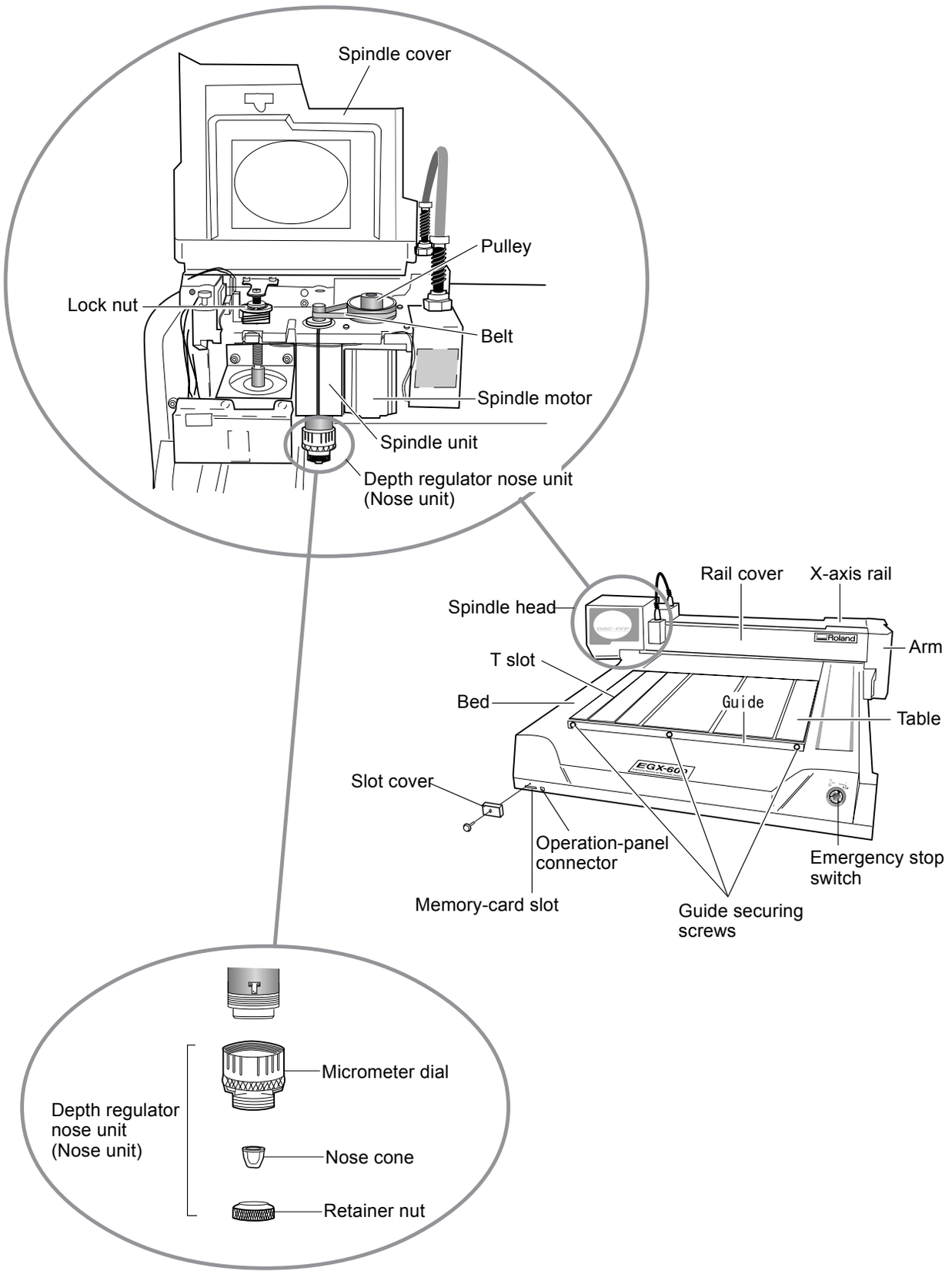
Follow the steps in "Unpacking and Repacking" on the packing carton to take out the included items and accessories.
Before you attempt installation, make sure all the included items are present.

			
Operation panel :1	Operation panel connector cable :1	Power cord :1	Depth regulator nose unit :1
			
Solid collet :1(*1)	Solid collet for diamond scrapers :1(*2)	Clamps :4(*3)	Wrenches (17 mm : 1, 10 mm :1)
			
Hexagonal screw driver (2 mm) :1	Hexagonal wrench (3 mm) :1	Roland Software Package CD-ROM :1	User's Manual (this manual) :1

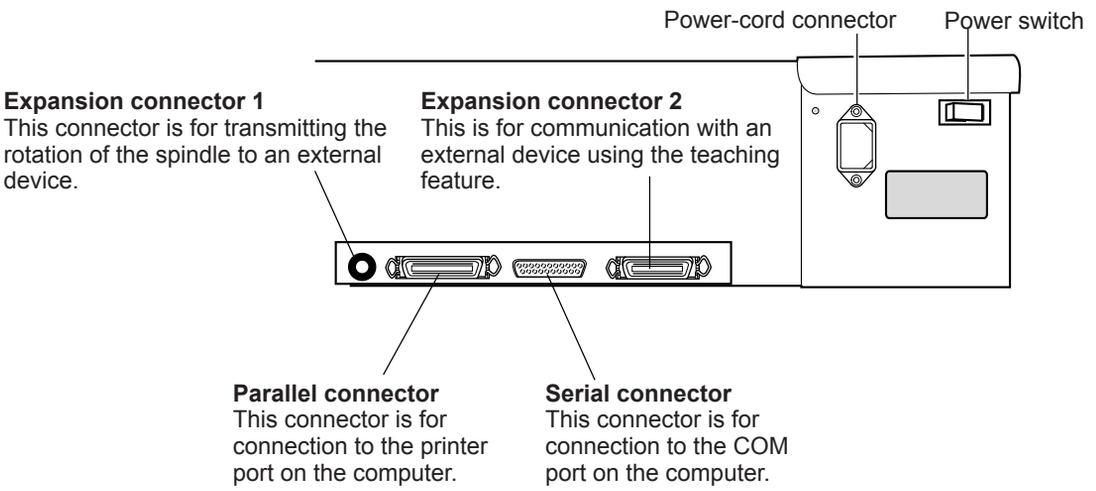
*1 This is for diameter-4.36 mm character or flat cutters. It cannot be used with diamond scrapers or end mills.
*2 The solid collet for diamond scrapers can also be used with a character cutter or flat cutter, but do not use it at a speed of 15,000 rpm or higher. There is danger of damage to the spindle unit due to vibration.
*3 The bolts adn nuts are installed on the machine.(They are used for attacking the packing retainers.)
*This machine does not come with a cutter or cutter holder

1-2 Names and Functions

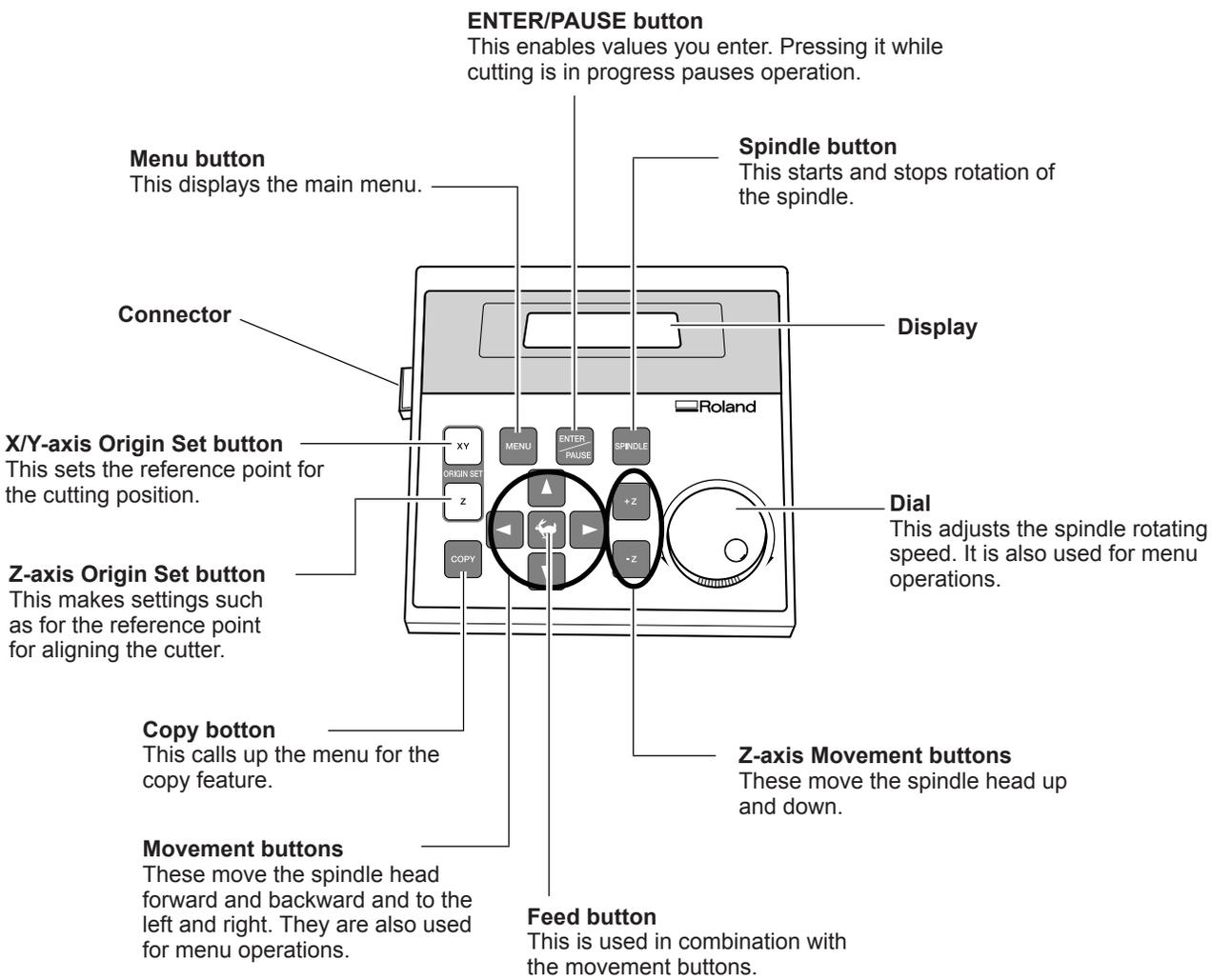
Front



Rear


Power-cord connector
Power switch
Expansion connector 1
This connector is for transmitting the rotation of the spindle to an external device.
Expansion connector 2
This is for communication with an external device using the teaching feature.
Parallel connector
This connector is for connection to the printer port on the computer.
Serial connector
This connector is for connection to the COM port on the computer.

Operation Panel


ENTER/PAUSE button
This enables values you enter. Pressing it while cutting is in progress pauses operation.
Menu button
This displays the main menu.
Spindle button
This starts and stops rotation of the spindle.
Connector
Display
Roland
X/Y-axis Origin Set button
This sets the reference point for the cutting position.
XY
ORIGIN SET
Z
MENU
ENTER
PAUSE
SPINDLE
+Z
-Z
COPY
Dial
This adjusts the spindle rotating speed. It is also used for menu operations.
Z-axis Origin Set button
This makes settings such as for the reference point for aligning the cutter.
Copy botton
This calls up the menu for the copy feature.
Z-axis Movement buttons
These move the spindle head up and down.
Movement buttons
These move the spindle head forward and backward and to the left and right. They are also used for menu operations.
Feed button
This is used in combination with the movement buttons.

1-3 Installation and Cable Connections

Instllation Site and Operating Environment

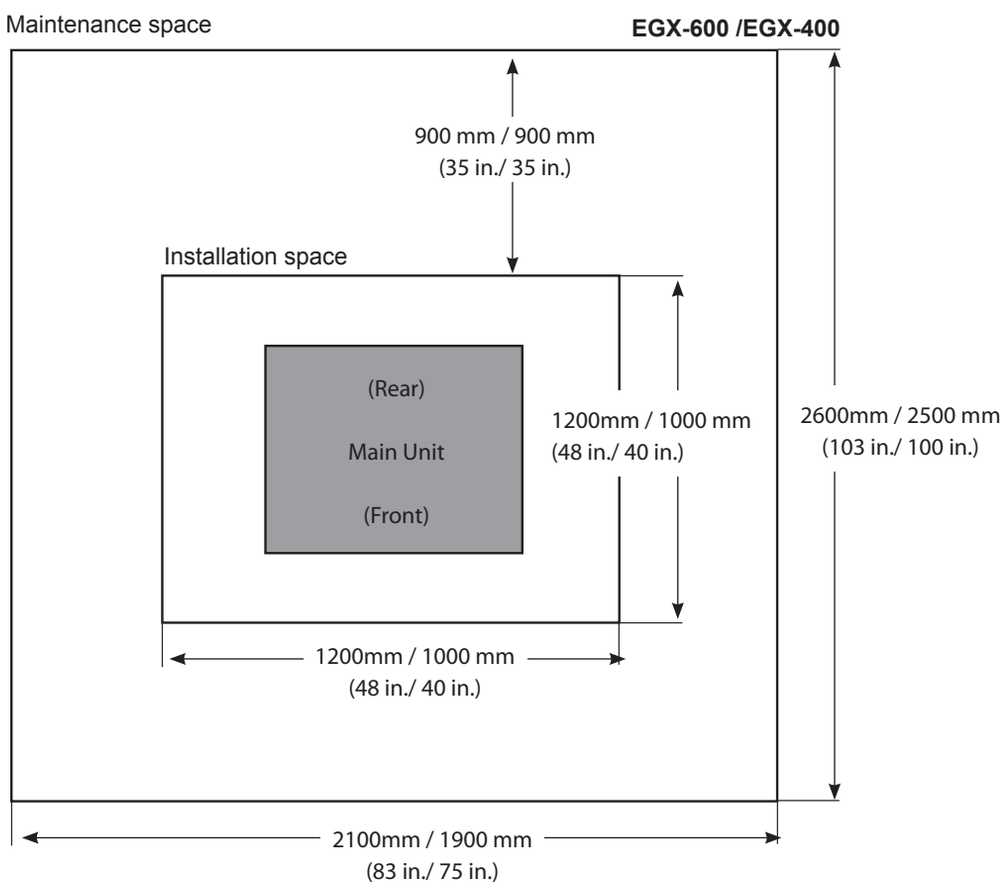
Install on a stable surface.Failure to do so may result in the unit tipping over, leading to injury

Unpackig , installation, and moving are operatioins that must be carried out by four or more persons. Failure to do so may result in falling of the unit, leading to injury.

Use this mahcine in an environment that meets th efollowing conditions.

- Temperature of 5 to 40°C (41 to 104 °F) and relative humidity of 35 to 85% (with no condensation).
- A level location with no wobble.
- Little dust.
- Little vibration.
- Good ventilation and heat dissipation.
- Low electrical noise. For example, avoid installing near an electric motor.

Also ensure that the following amount of space is available.



Notice

When the spindle motor is run at high speed while at a low temperature, roation may be unstable for some time. Insuch cases, allow to warm up by runnning at about 15,000 rpm with no load for around 15 minutes.

Connecting the Cables

Ground the unit with the ground wire.Failure to do so many result in risk of electrocution in the event of a mechanical problem.

Use only with the power cord included with this product.Use with other than the included power cord may lead to fire or electrocution.

Do not use with any electrical power supply that does not meet the ratings displayed on the unit. Use with any other power supply may lead to fire or electrocution.

Notice

Make sure the power to the machine is switched off before attempting to connect or disconnect the cables. Connect securely to ensure that accrdental disconnection does not occure during operation.

Conncect the operation panel and the power cable. If you're using a computer, then also connect a printer cable or serial cable. The ;printer cable or serial cable is sold separately. Use a cable that is compatible with the computer.

Printer cable

Use a commercially available printer cable.

Serial cable

If your cpmputer is as IBM AT-compatible personal computer, then use as optionally available XY-RS-34 cable 8or equivalet). A straight cable such as a modem cable will not work.

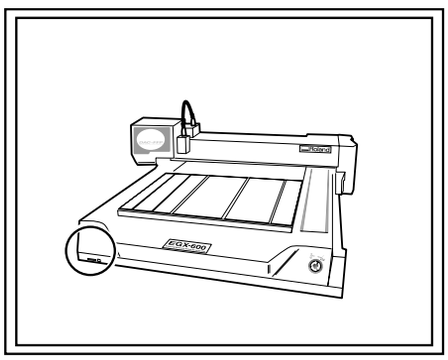
Point

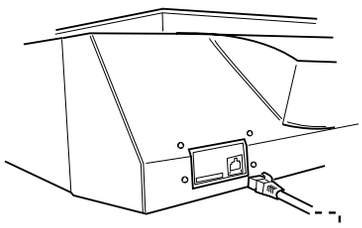
When the connection uses a serial cable, you need to make sure the communication parameters for the machine match the communication parameters for the computer. For more information about the computer's commnucation parameters, refer to the documentation for the program. The defaults for the programs included with this machine are set up to match without modification

Configuring the Communication Parameters for the Machine.

☞ See p.111 "I/O Submenus"

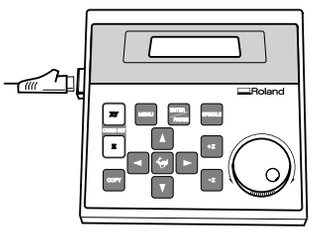
Front





Insert until it clicks into place.

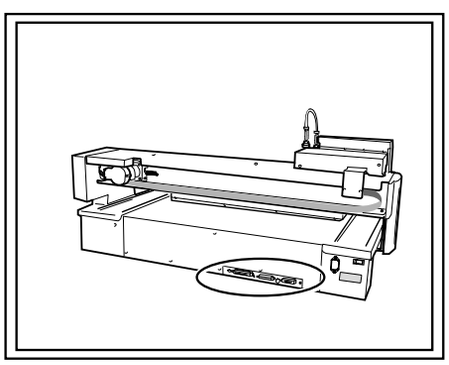
Operation-panel connector cable

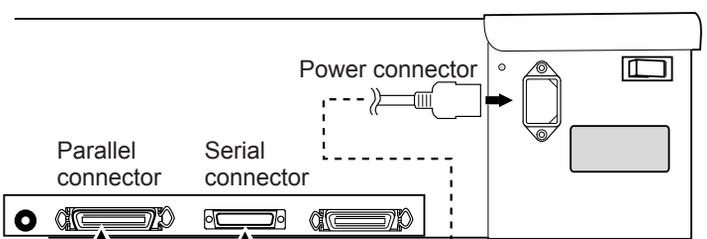


Notice

Do not insert an Ethernet cable or connect ro a modular jack.

Rear





Power connector

Parallel connector

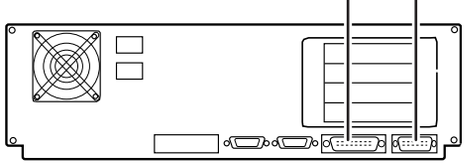
Serial connector

Secure with the clips.

Secure with the screws.

Printer port

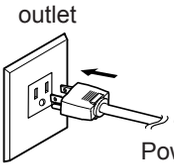
Serial port



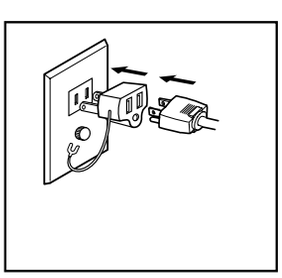
Printer cable

Serial cable

Power outlet



Power cord



Connect either a printer cable or serial cable

Chapter 2
Basic Operation

This chapter describes what you should know before you try to use the machine, such as the most basic operations and the procedures for safe use and handling. Be sure to read this chapter before you go on to the next step.

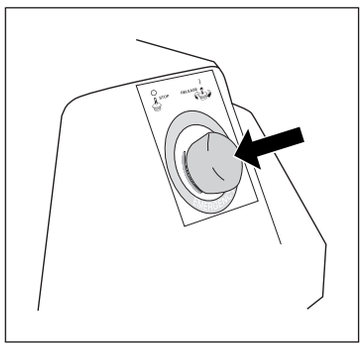
Operating the buttons makes the machine move. When operating the buttons, be sure to keep your hands away from the machine.

Do not let your hair, necktie, or the like touch the machine. There is danger of becoming it caught on the spindle or other moving parts.

2-1 Emergency Stop to Ensure Safety

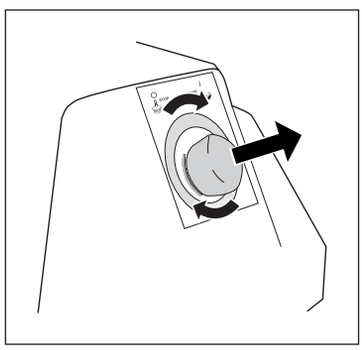
How to Perform an Emergency Stop

To stop the machine in an emergency in order to avoid danger, press the emergency stop switch. The machine immediately stops operating and quits cutting. Cutting cannot be resumed.



To Cancel an Emergency Stop

To cancel an emergency stop, turn the emergency stop switch in the direction of the arrow. The machine returns to the state it was in immediately after powerup.



Opening and Closing the Spindle Cover

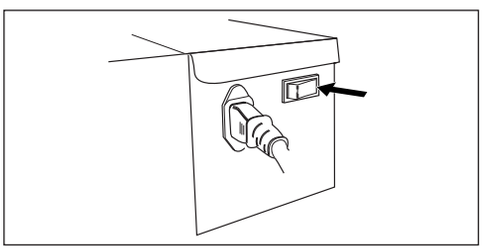
Be sure to close the spindle cover before you start cutting, and never open it while operation is in progress. For safety, opening the spindle cover during operation causes an emergency stop. To recover, switch off the power to the machine.
When the spindle cover is open, only head movement using the movement buttons is possible. You cannot use the buttons to rotate the spindle or perform cutting.

2-2 Switching the Power On and Off

Switching On the Power

Keep your hands away from the machine when you turn on the power. Also, do not place and objects where they may obstruct the operation of the spindle head, X-axis rail, bed, or other components.

Turning On the Power

❶ 

Turn on the power switch on the back of the machine.

The display shows the model name, and while this is displayed, internal initialization is performed. This takes about ten seconds.

```
EGX-600
Roland DG Corp.
```

❷

```
Hit "ENTER" key
```

When the screen shown at right appears, press ENTER/PAUSE.

This machine operates at this time. The spindle head moves to the left and back (to the VIEW position), then stops.

❸

```
X      0   Y 40700
Z      0   8000RPM
```

The display changes to the top screen, and startup ends.

Switching Off the Power

Turn off the power switch on the back of the machine. Do not the emergency stop switch for turning the power on and off in day-to-day use.

2-3 Moving the Spindle Head

Moving the Spindle Head

Do not put the operation panel on the machine while operation. Doing so may result in unexpected problems.

The spindle head moves in three directions, along the X, Y, and Z axes. When the display shows the top screen, pressing the movement buttons effects movement in the corresponding directions.

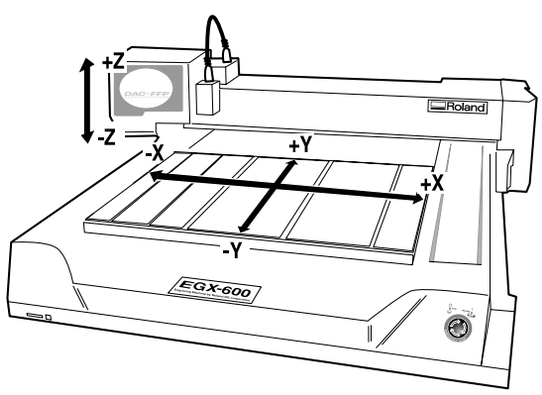
Point

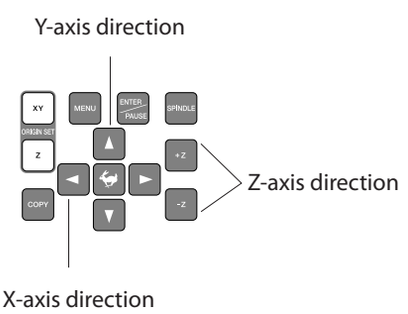
Make sure the display shows the top screen. You cannot perform movement when any other screen is displayed. Press MENU several times to display the top screen.

```
X     0   Y     0
Z     0   8000RPM
```

The speed of movement is determined by how you press the movement buttons, as described below.

Pressing and holding down a movement button	Slow continuous movement
While holding down , pressing and holding down a movement button	Fast continuous movement
Pressing and releasing a movement button	Movement of 0.01 mm per press
While holding down , pressing and releasing a movement button	Moveent of 0.1 mm per press

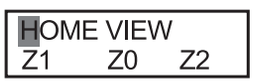




Moving the Spindle Head Out of the Way Quickly

This feature moves the spindle head directly to the back-left position of the table (the VIEW position). This is handy when loading or detaching a workpiece.

Moving to the VIEW Position

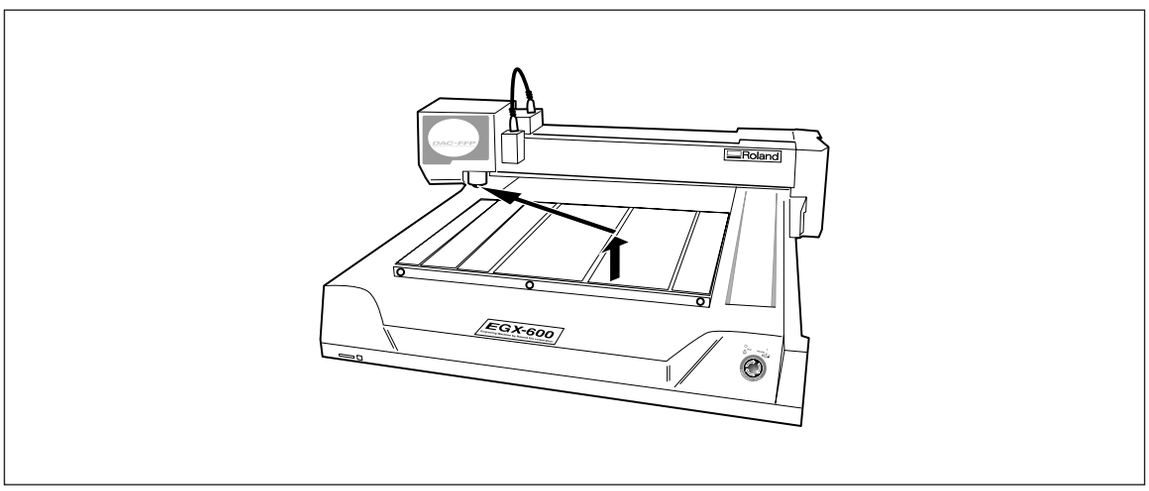
1. 

Press MENU until the screen shown at right appears.

2.

Press ►.
The blinking cursor moves to [VIEW].

3. Press ENTER/PAUSE.
The spindle head rises to the highest point, then moves to the VIEW position.



2-4 Starting and Stopping Spindle Rotation

Using Buttons to Start and Stop Rotation

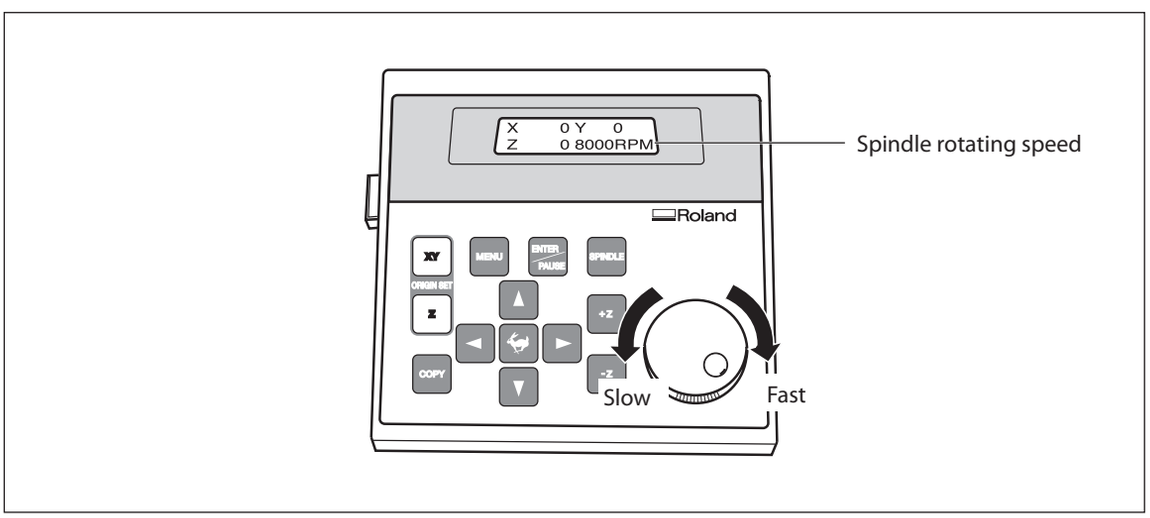
Holding down SPINDLE for 0.5 seconds or longer makes the spindle rotate. Pressing it again stops rotation.

Point

When the spindle cover is open, the spindle does not rotate.

Adjusting the Spindle Rotating Speed

To adjust the spindle rotating speed, you use the dial on the operation panel. The top screen displays the spindle rotating speed.



Notice

Avoid turning the dial while cutting is in progress. The feed rate drops momentarily, and the finished results of engraving may be adversely affected.

Forced Stop of Spindle Rotation

With this machine, you can set whether or not the spindle rotates. When it is set to rotate, rotation automatically starts when a command is received from the computer and stops when cutting ends. When set not to rotate, no rotation at all takes place. (Rotation does not occur even if you press SPINDLE .)
You use this feature at times such as when you are performing scribing using a diamond scraper.

Making the Setting for Spindle Rotation

❶

Press MENU until the screen shown at right appears.

❷

Press ► .
The blinking cursor moves to [OTHERS].

❸

Press ENTER/PAUSE .
The screen for setting spindle rotation appears.

❹ Use ◄ ► to move the blinking cursor to [ON] or [OFF]. Press ENTER/PAUSE .
[ON] makes the setting for rotation, and [OFF] makes the setting for forced stop.

2-5 Menu Operations

Displaying the Menus

All settings for this machine are made using menus. Pressing the following buttons displays the menu screens.

MENU	Main menu	XY ORIGIN SET	X/Y-axis origin-point setting menu
ENTER PAUSE	Pause menu (when pressed during cutting)	ORIGIN SET Z	Z-axis origin-point setting menu
COPY	Copy menu		

Point

For detailed information on using the menus

- See p.106 "Menu Flowchart"
- See p.110 "Detailed Description of the Menus"

Basic Menu Operations

When you display the menus, the buttons function as follows.

MENU Moving to the next screen

Pressing this several times eventually returns you to the top screen.

◀ ▶ Moving the blinking cursor

You use the blinking cursor to select items. In the example at right, for instance, you can select either [ON] or [OFF].

▲ ▼ Raising and lowering numerical values

Pressing either of these buttons while holding down increases or decreases the value by large amounts. Holding down the button makes the value change rapidly.

ENTER PAUSE Confirming and executing the selected item

Operations with ◀ ▶ ▲ ▼ do not enable settings, they only select the setting values.
A setting is enabled only when you press ENTER PAUSE. When you enable a setting, the item is displayed enclosed in "< >."
You also use this button to execute things and display submenus.

2-6 Care and Handling of Memory Cards

This section describes the basic usage and handling of memory cards.
This machine can execute cutting data saved on a memory card, and can save sequences created using the teaching feature. For more information about these operations, see "Executing Cutting Data Saved on a Memory Card" on p.67 and "The Teaching Feature" on p.73.

Types of Memory Cards You Can Use

Use commercially available "SD (Secure Digital) Memory Card" or "MultiMediaCard", which are available in sizes of 16 MB, 32 MB, and 64 MB. Note that copyright-protection functions are not used with this machine.

Roland DG Corp. has verified the operation of the following memory cards.

Manufacturer	Part number	Capacity
SanDisk	SDMB-16	16 MB
	SDMB-32	32 MB
	SDMB-64	64 MB
Panasonic	RP-SD016	16 MB
	RP-SD032	32 MB
	RP-SD064	64 MB
HAGIWARA SYS-COM	HPC-MC32M	32 MB
	HPC-MC64M	64 MB

Notice

This machine does not detect the write-protect switch on an SD Memory Card, even when the switch is set to "LOCK."

Memory-card Writers You Can Use

To save cutting data on a memory card or to format a memory card, you use a commercially available memory-card writer or adapter. One that meets the following specifications is required.

- Compatible with "SD Memory Card" or "MultiMediaCard" you're using
- Able to be connected to your computer running Windows
- Able to read and write files compatible with Windows

Roland DG Corp. has verified the operation of the following memory-card writers.

Manufacturer	Part number	Operating environment
VICS Technology	RD5	Windows 98/Me/2000/XP

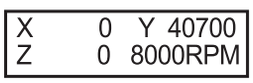
Point

Windows must be able to treat the memory card as a single volume. Nearly all memory-card writers that are compatible with Windows meet this requirement.

Inserting and Removing a Memory Card

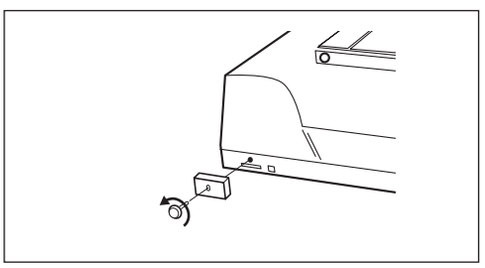
Inserting a Memory Card

❶



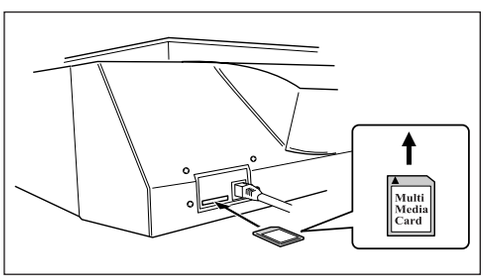
Make sure the display shows the top screen.

❷



Remove the slot cover.

❸



Hold the card with the label side facing up and the notch on the right, and insert it into the memory-card slot. Press it in gently until it clicks into place.

❹ Attach the slot cover.

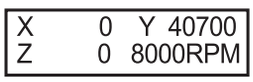
Notice

◆Be careful to orient the memory card correctly when inserting it. An incorrectly inserted card will not function and may even cause breakdown.

◆Before you insert a memory card, carefully clean away any cutting waste from the memory card and the area around the memory-card slot.

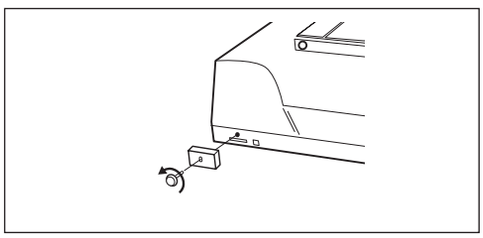
Removing a Memory Card

❶



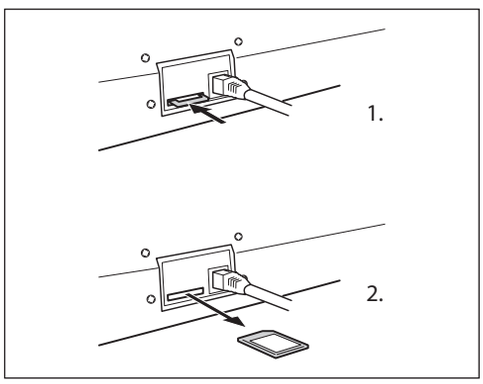
Make sure the display shows the top screen.

❷



Remove the slot cover.

❸



Gently press the card in until it clicks into place, then pull it out from the memory-card slot.

❹ Attach the slot cover.

Notice

Do not switch off the power while a memory card is being accessed.

Do not switch off the machine while the display shows a message such as [Now Processing]. Doing so may result in data corruption or malfunction.

Do not insert or remove a memory card in any of the following circumstances.

- ◆ After you turn on the machine and before the top screen appears
- ◆ While the memory card is being accessed (When the display shows a message such as [Now Processing])
- ◆ While a screen for dating or calling up data is displayed (When the display shows a message such as [Select File])

Doing so may result in data corruption, failure to display the correct file names, or malfunction.

Formatting a Memory Card

Formatting a memory card is normally not necessary. However, the machine may be unable to use a memory card that has been reformatted for use with another device, such as a digital camera. In such cases, use the following method to reformat the card again.

Notice

Formatting deletes all data saved on the memory card. Before you format the card, make sure that it contains no data you want to keep.

Performing Formatting

To perform formatting, you use a memory-card writer. For information on the specific method, refer to the documentation for the memory-card writer you're using. Also, give attention to the following points when formatting.

For a MultiMediaCard

Use the standard formatter for Windows. (That is, use the same operation as for formatting a floppy disk.) Depending on t he version of Windows you're using, you may be able to choose the file system to use for formatting. In such cases, be sure to select FAT. Do not format as FAT32 or NTFS.

For an SD (Secure Digital) Memory Card

Perform formatting using the same method as for a MultiMediaCard. If a dedicated SD formatter is available, then use that.

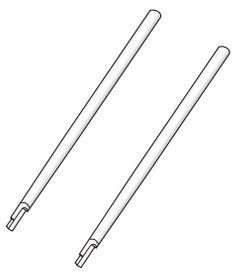
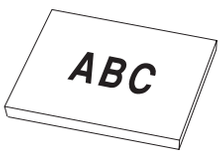
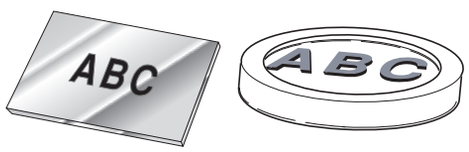
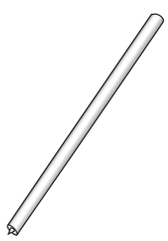
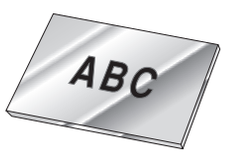
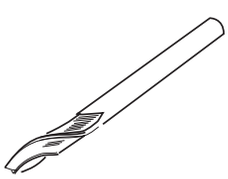
Chapter 3
Preparations

This chapter describes how to install a cutter, how to load a work-piece, and other preparations you make before you carry out cutting.

3-1 Selecting the Cutter Installation Method

Cutter Types and What They Are Suited For

You can install any of a wide variety of tools on this machine. You can also choose whether to use the depth regulator nose unit (nose unit). Choose a tool suited to the task at hand, and decide whether to use the nose unit.

Tool	With nose unit	No nose unit
Character cutter Flat cutter 	◆ Engraving acrylic and other plastic plates (*1) ☞ P. 39, "Cutter Installation Method 1" 	◆ Engraving plates of aluminum or brass ◆ Three-dimensional engraving and creating reliefs using plastic materials ☞ P. 44, "Cutter Installation Method 2" 
Diamond scraper (*2) 	◆ Unsuitable	◆ Scribing plates of aluminum or brass (*2) ☞ P. 48, "Cutter Installation Method 3" 
End mill (*3) 	◆ Unsuitable	◆ Creating reliefs and performing 3D cutting using plastic material ☞ P. 53, "Cutter Installation Method 4"

*1 Use of the nose unit may not be suitable when performing raised engraving of text or flat-drag cutting over a large surface area. In such cases, use without the nose unit.

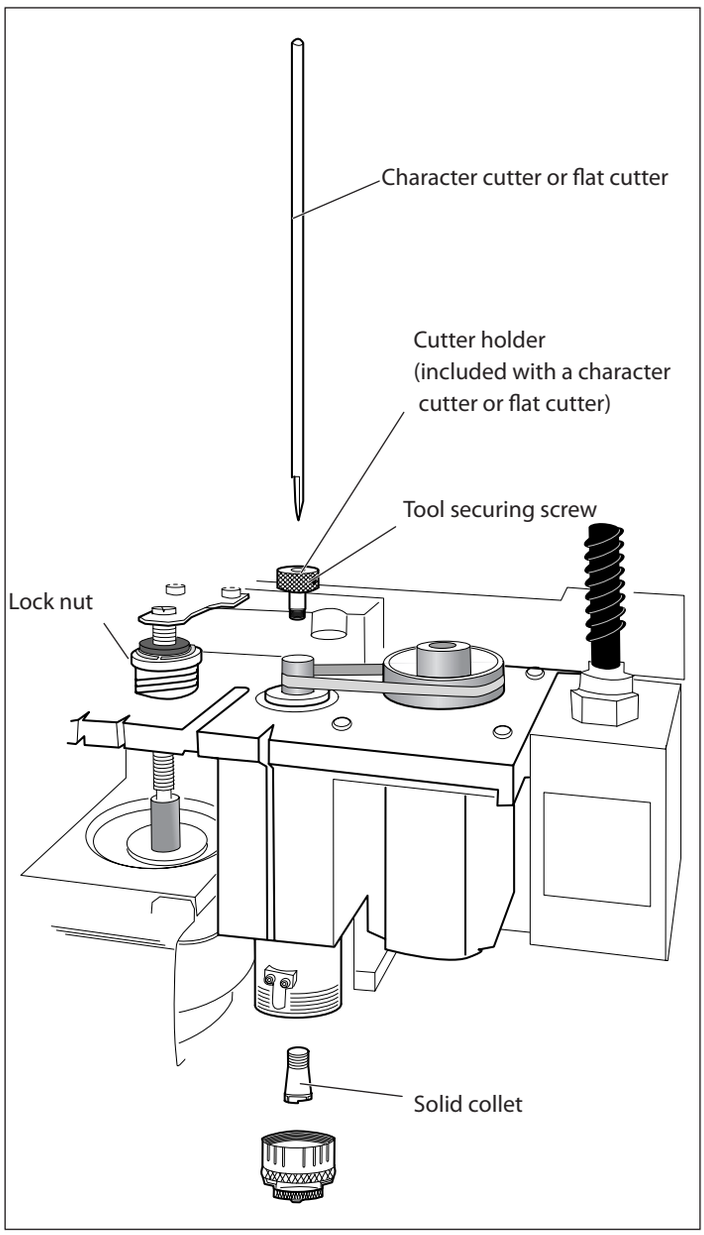
*2 This is suited to relatively small text and can produce finished results that are more attractive and have less burring than engraving with a character cutter. The solid collet for diamond scrapers is required to install a diamond scraper.

*3: An optionally available collet set for end-mills is required to install and end mill

3-2 Cutter Installation Method 1 (With Nose Unit)

This is for when you perform engraving using the nose unit on an acrylic plate or the like. The tip of the nose traces the material surface, which facilitates obtaining a uniform cutting-in depth. The tool used is a character cutter or a flat cutter.
This method is not suitable for aluminum, brass, or other materials that are easily scratched.

Lock nut : Loosen
[AUTO Z CONTROL] : ON
[REVOLUTION] : ON



Notice

The solid collet for diamond scrapers can also be used with a character cutter or flat cutter, but do not use it at a speed of 15,000 rpm or higher. There is danger of damage to the spindle due to vibration.

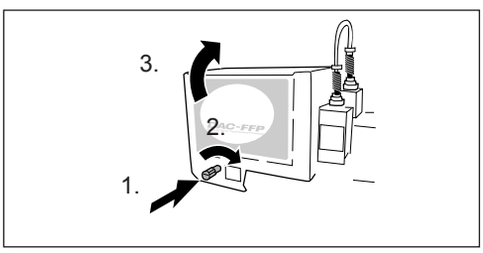
Installing a Character Cutter (With Nose Unit)

While installing the cutter, do not allow the operation panel to be touched inadvertently. When using the operation panel, keep hands away from moving areas of the machine. Unintended operation of the machine may lead to danger of becoming caught.

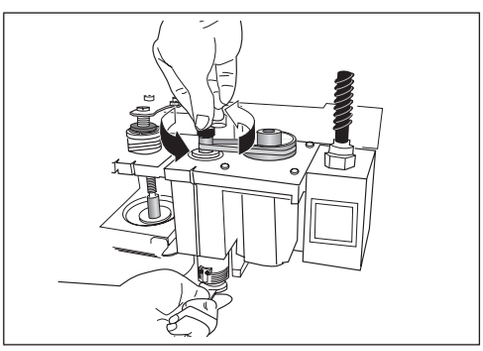
Do not touch the tip of the cutter. Doing so may result in injury.

Securely fasten the cutter and workpiece in place. Otherwise they may come loose during cutting, resulting in injury.

1. Installing the Cutter Holder and Collet

❶ 

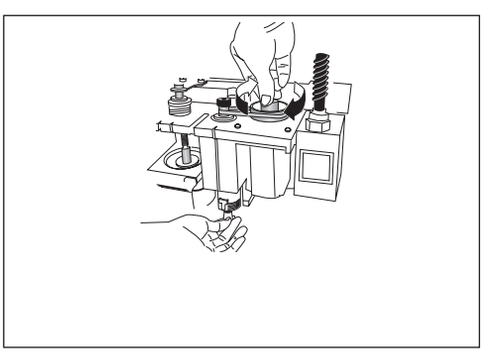
Open the spindle cover.

❷ 

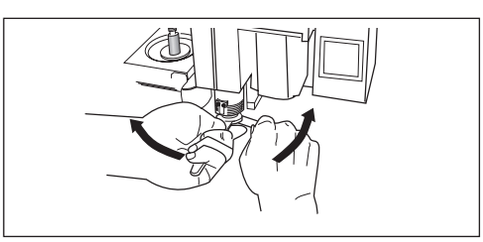
While using a wrench (17 mm) to keep the spindle immobile, tighten the cutter holder securely.

Point

The cutter holder is reverse-threaded (that is, you turn it counterclockwise to tighten it). Be careful to turn it in the correct direction.

❸ 

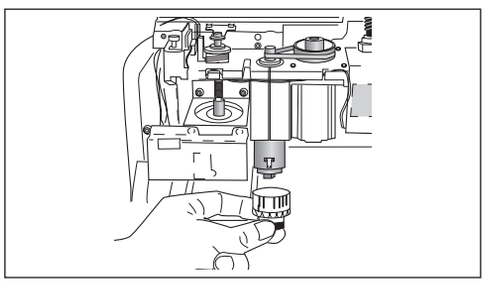
Insert the included solid collet from below. While gently holding the collet in place, turn the spindle by hand until it is finger-tight.

❹ 

Use the included wrench to tighten the collet.
The correct tightening torque is 32 kgf-cm.

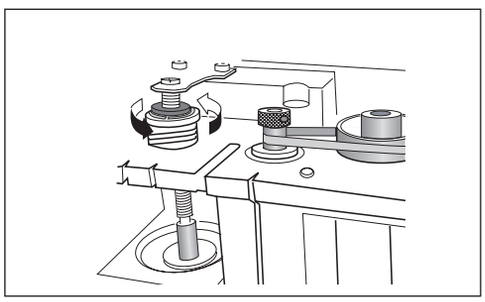
2. Nose-unit Installation and Menu Settings

❶



Install the nose unit. Tighten fully, then loosen two turns.

❷



Fully loosen the lock nut.

> **Notice**
> Be sure to loosen the lock nut.

❸

```
I/O      OTHERS
TEACHING SELF
```

```
AUTO Z CONTROL
<ON>       OFF
```

Use the menus to set [AUTO Z CONTROL] to ON.

① Press MENU several times to display the screen shown at right.
② Press ► to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press MENU several times to display the screen shown at right.
④ Press ◄ to move the blinking cursor to [ON], then press ENTER/PAUSE.

❹

```
I/O      OTHERS
TEACHING SELF
```

```
 REVOLUTION
<ON>       OFF
```

Use the menu to set [REVOLUTION] to ON.

① Press MENU several times to display the screen shown at right.
② Press ► to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press ◄ to move the blinking cursor to [ON], then press ENTER/PAUSE.

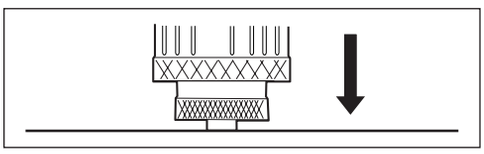
❺

```
X    0   Y    0
Z    0   8000RPM
```

Press MENU several times to return to the top screen.

3. Cutter Installation and Alignment

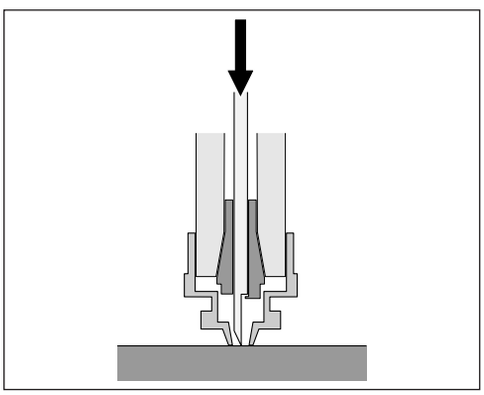
❶



Lower the spindle until the tip of the nose unit touches the table.

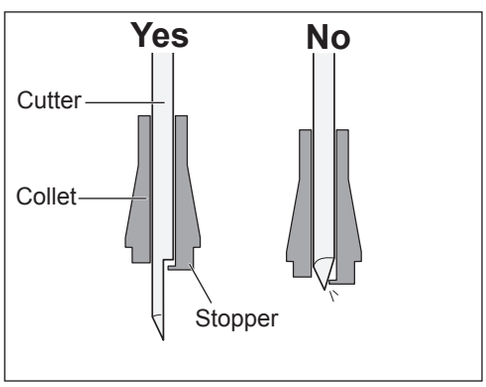
When the nose touches the table, operation stops automatically.

❷

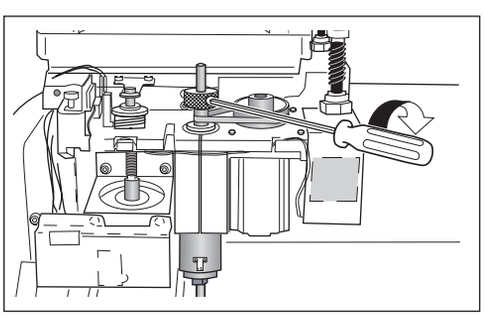


Insert the cutter (diameter 4.36 mm), then bring the tip lightly into contact with the table.

When you insert the cutter, orient it so that it will not catch on the collet.

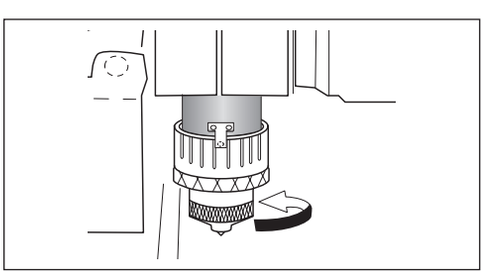


❸



Use the included hexagonal screwdriver to tighten the tool securing screw. Raise the spindle.

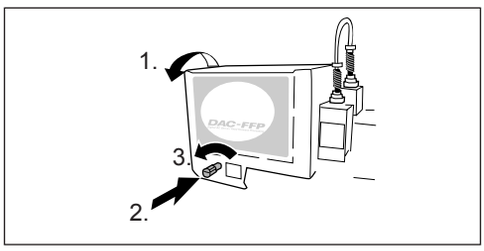
❹



Tighten the nose unit by 4 to 8 ticks on the scale.

Point

The amount you tighten the nose unit determines the cutting-in depth. Adjust it to suit the task. An amount of 4 to 8 scale ticks corresponds to 0.1 to 0.2 mm (0.004 to 0.008 in.). One scale tick is 0.0254 mm (0.001 in.), and one full turn is 25 scale ticks, or 0.635 mm (0.025 in.).

❺ 

Close the spindle cover.

Cutting Parameters When Using the Nose Unit

When you use the preceding method, there is no need to set the cutting-in depth or the cut-out amount by a software or the operation panel. The cutting-in depth is determined mechanically by the amount of tightening of the nose unit.

Point

For more information about how to set the cutting parameters

☞ See p.61 "Setting the Cutting Parameters"
☞ See p.134 " Examples of Settings for Cutting Parameters"

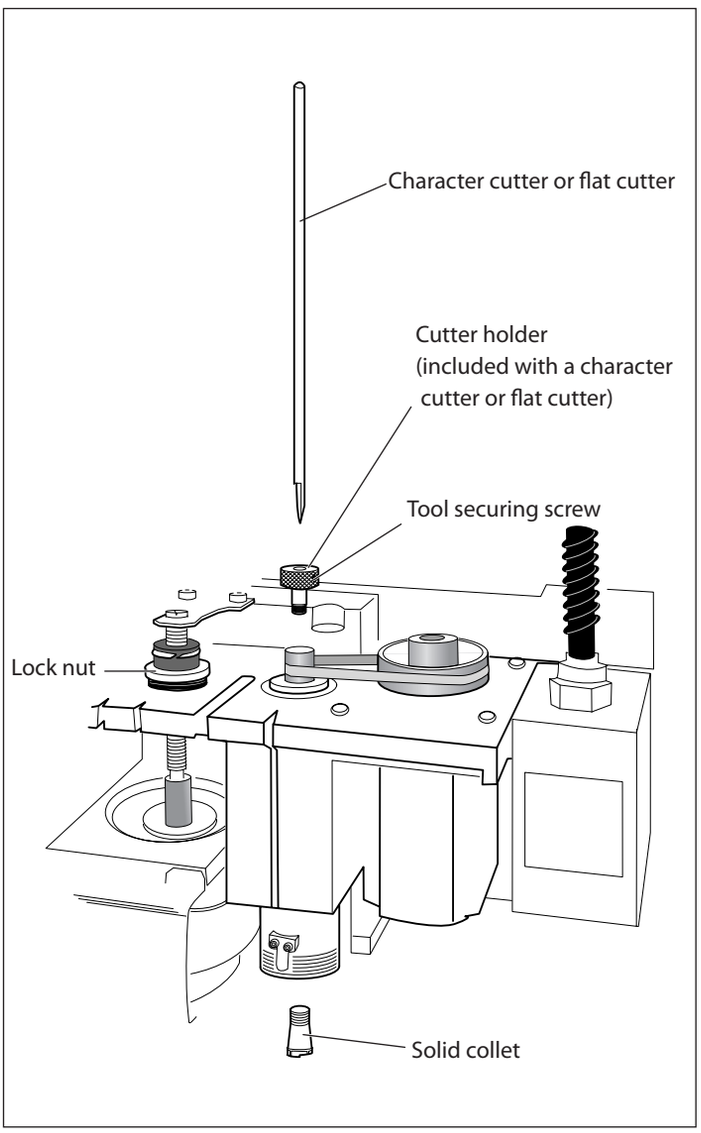
For detailed information about the nose unit

☞ See p.110 "Detailed Description of the Menus," the section " AUTO Z CONTROL "
☞ See p.105 "Detailed Description of the Nose Unit"

3-3 Cutter Installation Method 2 (No Nose Unit)

This is for when you perform engraving without using the nose unit. The tool used is a character cutter or a flat cutter.
This method does not scrape the workpiece, so it is suitable for aluminum, brass and other materials that are easily scratched.
Note, however, that in order to obtain a uniform cutting-in depth, the thickness of the workpiece must also be uniform.

Lock nut : Tighten
[AUTO Z CONTROL] : OFF
[REVOLUTION] : ON



Notice

The solid collet for diamond scrapers can also be used with a character cutter or flat cutter, but do not use it at a speed of 15,000 rpm or higher. There is danger of damage to the spindle due to vibration.

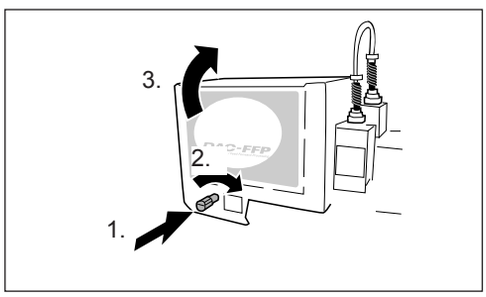
Installing a Character Cutter (With No Nose Unit)

While installing the cutter, do not allow the operation panel to be touched inadvertently. When using the operation panel, keep hands away from moving areas of the machine. Unintended operation of the machine may lead to danger of becoming caught.

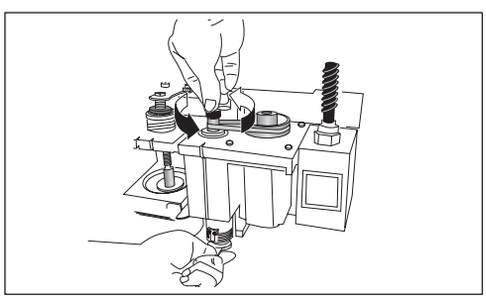
Do not touch the tip of the cutter. Doing so may result in injury.

Securely fasten the cutter and workpiece in place. Otherwise they may come loose during cutting, resulting in injury.

1. Installing the Cutter Holder and Collet

❶ 

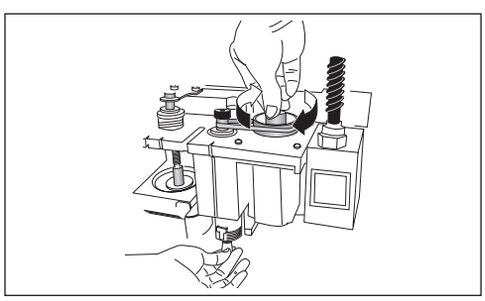
Open the spindle cover.

❷ 

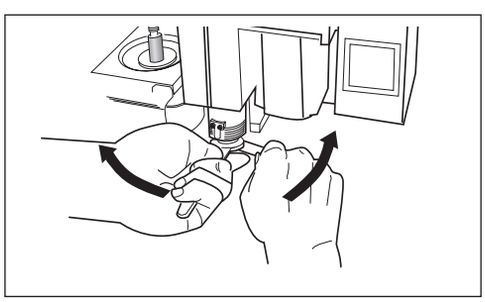
While using a wrench (17 mm) to keep the spindle immobile, tighten the cutter holder securely.

Point

The cutter holder is reverse-threaded (that is, you turn it counterclockwise to tighten it). Be careful to turn it in the correct direction.

❸ 

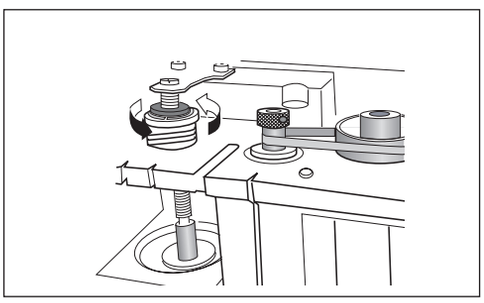
Insert the included solid collet from below. While gently holding the collet in place, turn the spindle by hand until it is finger-tight.

❹ 

Use the included wrench to tighten the collet.
The correct tightening torque is 32 kgf-cm.

2. Menu Settings

❶



Fully tighten the lock nut.

❷

I/O OTHERS
TEACHING SELF

AUTO Z CONTROL
ON <OFF>

Use the menu to set [AUTO Z CONTROL] to OFF.

① Press MENU several times to display the screen shown at right.
② Press ► to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press MENU several times to display the screen shown at right.
④ Press ► to move the blinking cursor to [OFF], then press ENTER/PAUSE

Notice

Be sure to set [AUTO Z CONTROL] to OFF.

❸

I/O OTHERS
TEACHING SELF

REVOLUTION
<ON> OFF

Use the menu to set [REVOLUTION] to ON.

① Press MENU several times to display the screen shown at right.
② Press ► to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press ◄ to move the blinking cursor to [ON], then press ENTER/PAUSE.

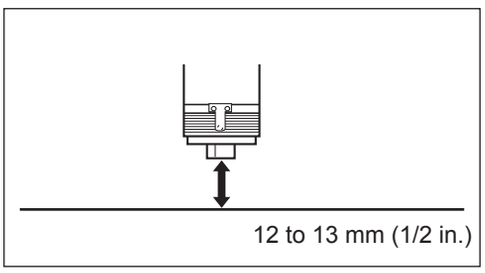
❹

X 0 Y 0
Z 0 8000RPM

Press MENU several times to return to the top screen.

3. Cutter Installation and Alignment

❶

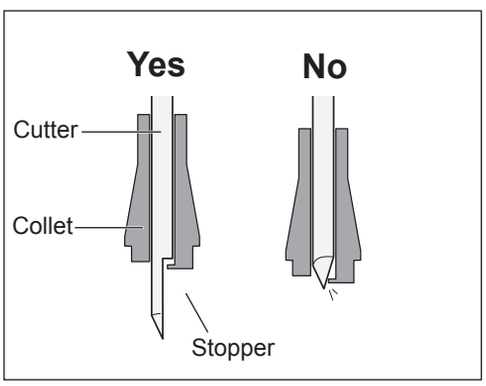


Load the workpiece, then move the spindle to above the workpiece. Lower the spindle until the tip of the collet is at a height about 12 to 13 mm (1/2 in.) from the surface of the material.

Point

For more information about how to load material
☞ p.57 "Loading Material and Setting the Reference Point for Cutting"

❷



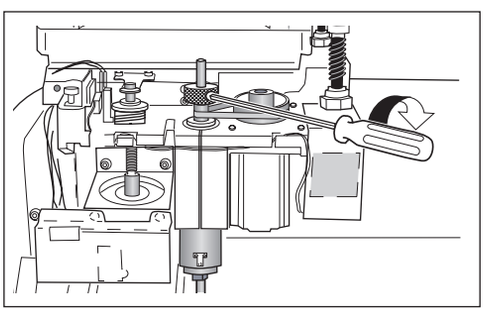
Insert the cutter (diameter 4.36 mm), then bring the tip lightly into contact with the workpiece. When you insert the cutter, orient it so that it will not catch on the collet.

If the cutter does not reach the workpiece, lower the spindle further.

Point

Damage to the workpiece can be prevented by placing a sheet of thin paper over the workpiece. When you do this it is a good idea to cut in by a depth increased by an amount equal to the thickness of the paper (about 0.002 in.).

❸



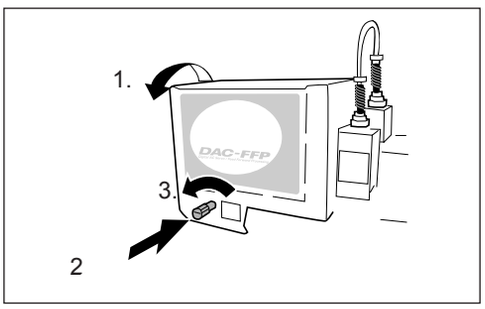
Use the included hexagonal screwdriver to tighten the tool securing screw.

❹

Use the menus to set the height reference point (Z0).

① Press ORIGIN SET Z.
② Make sure the blinking cursor is at [Z0], then press ENTER PAUSE.
③ Press MENU to return to the top screen.

❺

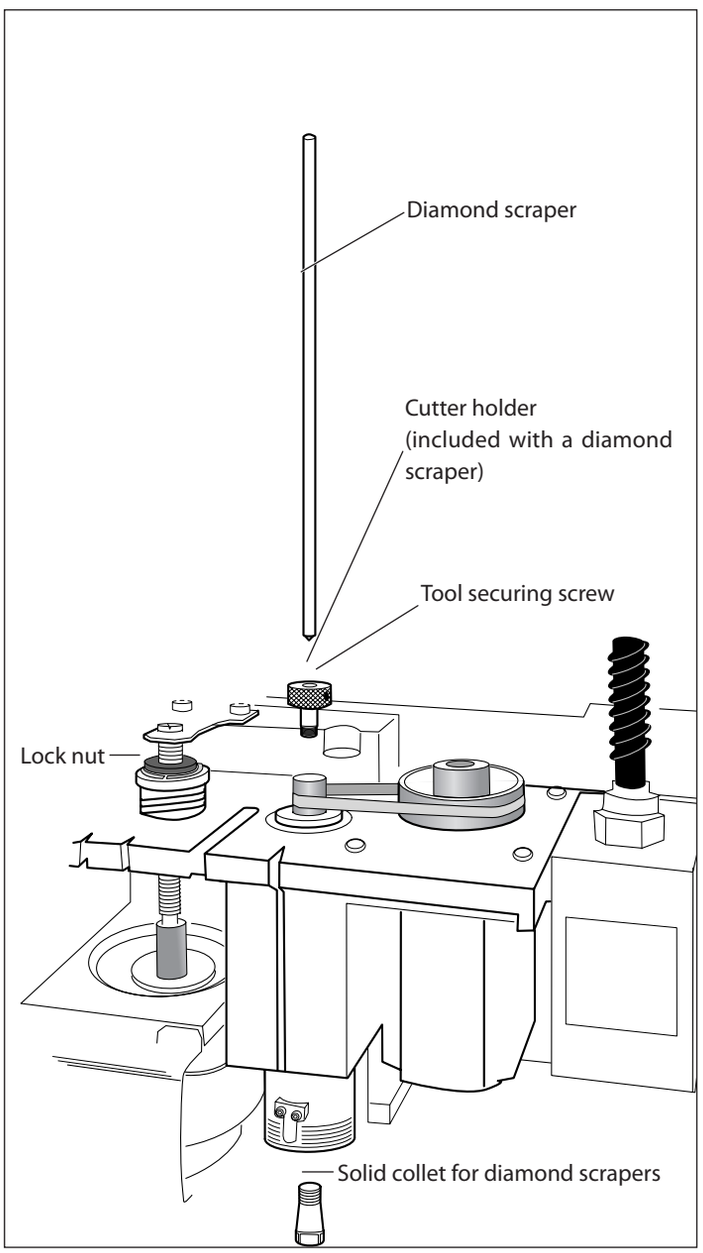


Close the spindle cover.

3-4 Cutter Installation Method 3 (Diamond Scraper)

This is for when you scribe aluminum or brass plates. The tool used is a diamond scraper, and the spindle is not rotated. Engraving is performed by scraping the workpiece, so it achieves attractive finished results with little burring, but it does not obtain deep cutting-in.

Lock nut: Loosen
[AUTO Z CONTROL]: ON
[REVOLUTION]: OFF



Installing a Diamond Scraper

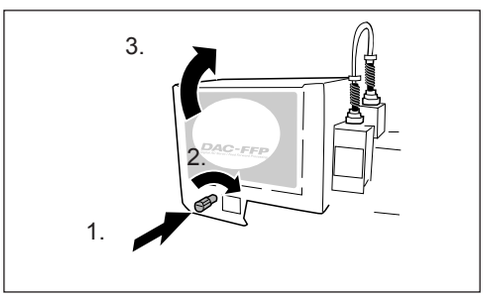
While installing the cutter, do not allow the operation panel to be touched inadvertently. When using the operation panel, keep hands away from moving areas of the machine. Unintended operation of the machine may lead to danger of becoming caught.

Do not touch the tip of the cutter. Doing so may result in injury.

Securely fasten the cutter and workpiece in place. Otherwise they may come loose during cutting, resulting in injury.

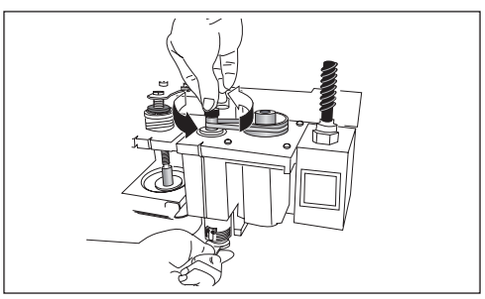
1. Installing the Cutter Holder and Collet

❶



Open the spindle cover.

❷

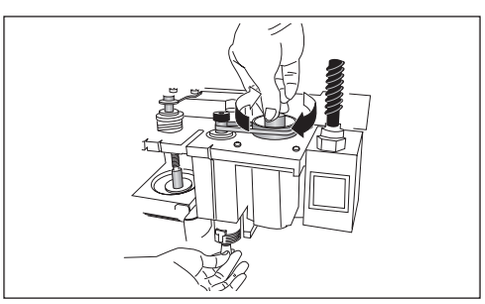


While using a wrench (17 mm) to keep the spindle immobile, tighten the cutter holder securely.

Point

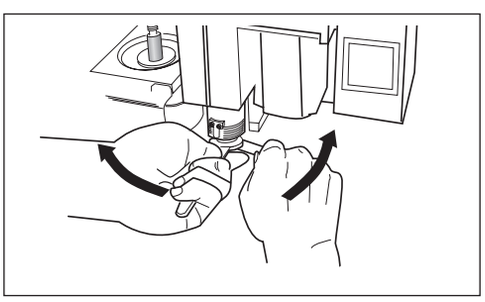
The cutter holder is reverse-threaded (that is, you turn it counterclockwise to tighten it). Be careful to turn it in the correct direction.

❸



Insert the solid collet for diamond scrapers from below. While gently holding the collet in place, turn the spindle by hand until it is finger-tight.

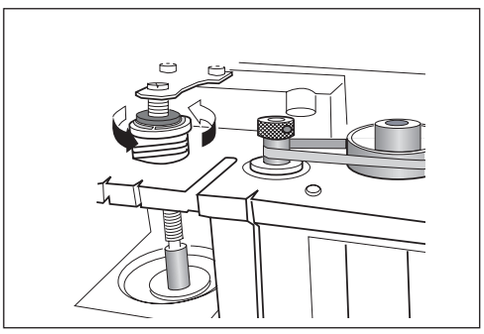
❹



Use the included wrench to tighten the collet. The correct tightening torque is 32 kgf-cm.

2. Menu Settings

❶



Fully loosen the lock nut.

Notice

Be sure to loosem the lock nut.

❷

```
I/O          OTHERS
TEACHING SELF
```

```
AUTO Z CONTROL
<ON>          OFF
```

Use the menus to set [AUTO Z CONTROL] to ON.

① Press MENU several times to display the screen shown at right.
② Press ▶ to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press MENU several times to display the screen shown at right.
④ Press ◀ to move the blinking cursor to [ON], then press ENTER/PAUSE.

❸

```
I/O          OTHERS
TEACHING SELF
```

```
 REVOLUTION
 ON          <OFF>
```

Use the menus to set [REVOLUTION] to OFF.

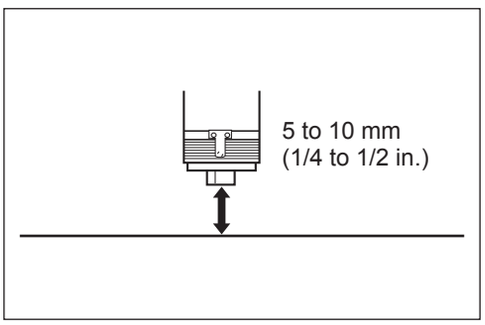
① Press MENU several times to display the screen shown at right.
② Press ▶ to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press ▶ to move the blinking cursor to [OFF], then press ENTER/PAUSE.

❹

```
X    0    Y        0
Z    0    8000RPM
```

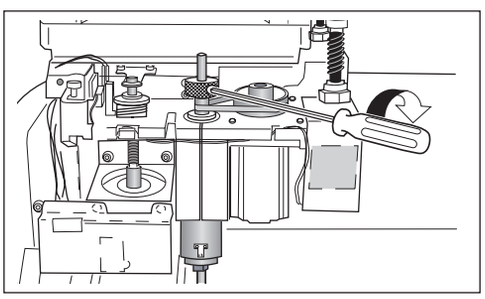
Press MENU several times to return to the top screen.

3. Cutter Installation

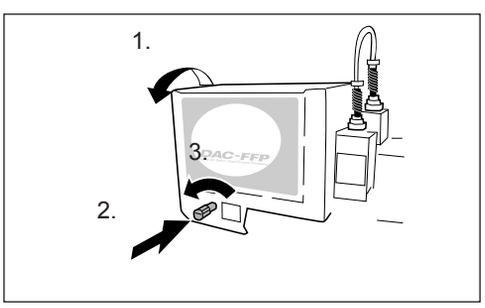
❶ 

Lower the spindle until the tip of the collet is at a height about 5 to 10 mm (1/4 to 1/2 in.) from the surface of the table.

❷ Insert the diamond scraper, then bring the tip lightly into contact with the table.

❸ 

Use the included hexagonal screwdriver to tighten the tool securing screw.

❹ 

Close the spindle cover.

Cutting Parameters for the Diamond Scraper

When you use the preceding method, there is no need to set the cutting-in depth or the cut-out amount. The cutting-in depth is determined by the pressure of the cutter. (The preceding method produces a uniform cutter force for the machine.)

Point

For more information about how to set the cutting parameters

☞ See p.61 "Setting the Cutting Parameters"
☞ See p.134 "Examples of Settings for Cutting Parameters"

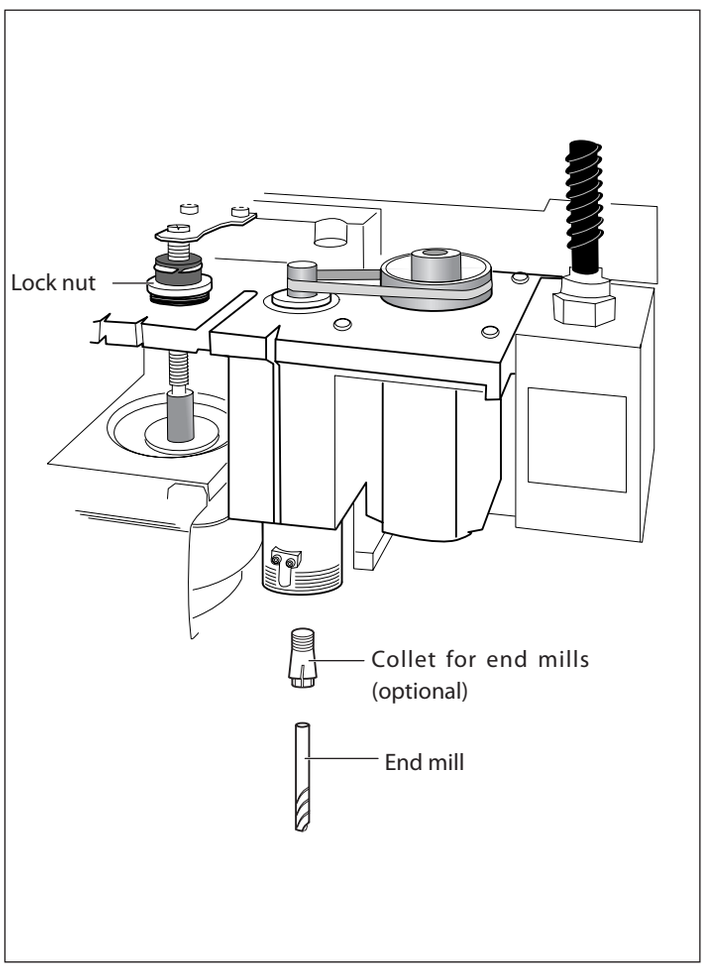
For detailed information about the cutting-in depth and cut-out amount

☞ See p.110 in "Detailed Description of the Menus," the section "AUTO Z CONTROL"

3-5 Cutter Installation Method 4 (End Mill)

This is for when you perform three-dimensional cutting of reliefs and the like using an end mill. An optionally available collet set for end mills is required to install an end mill.

Lock nut : Tighten
[AUTO Z CONTROL] : OFF
[REVOLUTION] : ON



Installing an End Mill

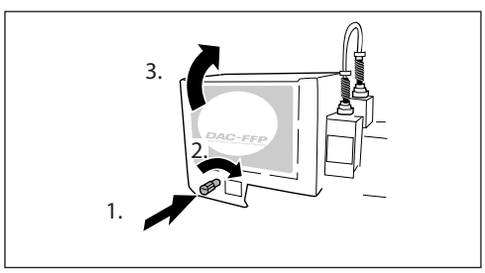
While installing the cutter, do not allow the operation panel to be touched inadvertently. When using the operation panel, keep hands away from moving areas of the machine. Unintended operation of the machine may lead to danger of becoming caught.

Do not touch the tip of the cutter. Doing so may result in injury.

Securely fasten the cutter and workpiece in place. Otherwise they may come loose during cutting, resulting in injury.

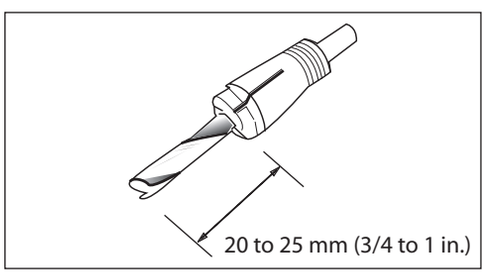
1. Installing the Collet and End Mill

❶



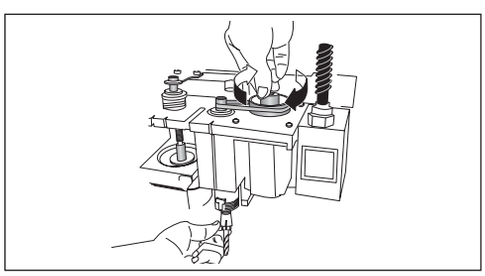
Open the spindle cover.

❷



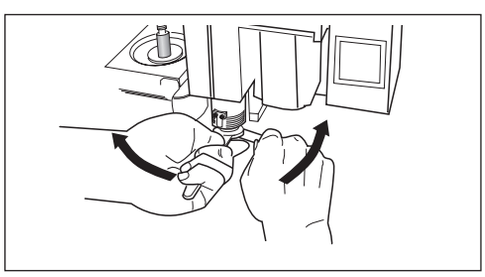
Insert the end mill into the optionally available end-mill collet.

❸



Insert the end mill and collet from below. While gently holding the collet in place, turn the spindle by hand until it is finger-tight.

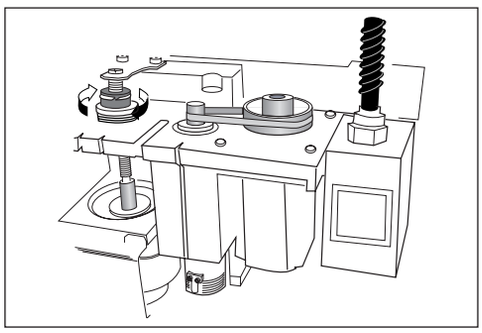
❹



Use the included wrench to tighten the collet.
The correct tightening torque is 32 kgf-cm.

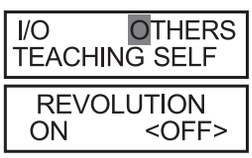
2. Menu Settings

❶



Fully tighten the lock nut.

❷



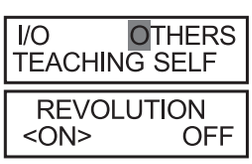
Use the menus to set [AUTO Z CONTROL] to OFF.

① Press MENU several times to display the screen shown at right.
② Press ► to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press MENU several times to display the screen shown at right.
④ Press ► to move the blinking cursor to [OFF], then press ENTER/PAUSE.

Notice

Be sure to set [AUTO Z CONTROL] to OFF.

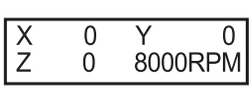
❸



Use the menu to set [REVOLUTION] to ON.

① Press MENU several times to display the screen shown at right.
② Press ► to move the blinking cursor to [OTHERS], then press ENTER/PAUSE.
③ Press ◄ to move the blinking cursor to [ON], then press ENTER/PAUSE.

❹



Press MENU several times to return to the top screen.

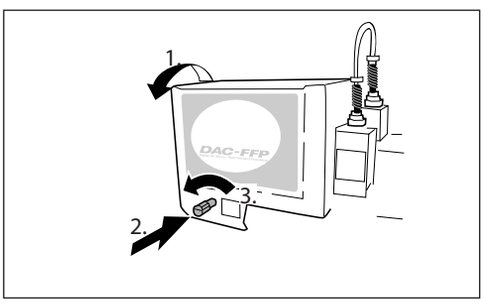
3. Aligning the Cutter

❶ Load a workpiece and move the end mill to the top surface of the material.

Point

For information on how to load material

☞ See p.57 "Loading Material and Setting the Reference Point for Cutting"

❷ 

Close the spindle cover.

❸ Hold down SPINDLE for 0.5 seconds or longer.
The spindle rotates.

❹ Lower the spindle a little at a time, and stop it when it is just barely cutting the surface of the workpiece. Press SPINDLE to stop the spindle.

❺

```
SET   Z1  Z0  Z2
SURFACE <   0 >
```

Use the menus to set the height reference point (Z0).

① Press ORIGIN SET Z.
② Make sure the blinking cursor is at [Z0], then press ENTER PAUSE.
③ Press MENU to return to the top screen.

3-6 Loading Material and Setting the Reference Point for Cutting

Securely fasten the cutter and workpiece in place. Otherwise they may come loose during cutting, resulting in injury.

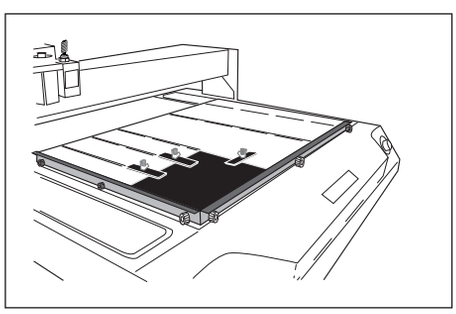
When you're using a clamp or other jig, give sufficient thought to positioning so that the tool and spindle unit do not collide during operation. The tool may break and fly off, resulting in injury. Breakdown may also result.

Loading Material

You use the following method to load a workpiece. The table has T slots, and you can also install other jigs. There is also a guide for positioning on the side of the table.

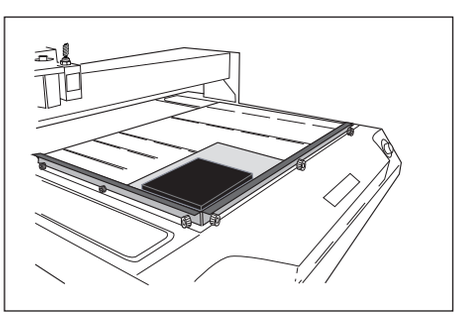
Clamp

This is included with the machine. Pass the bolt through a T slot and tighten the nut.



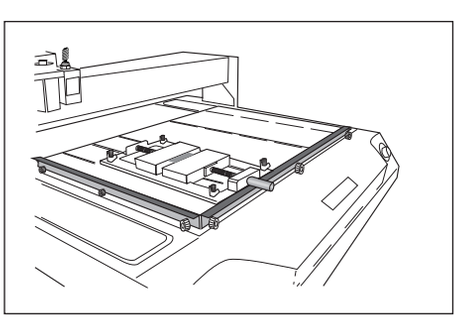
Adhesive sheet

This method uses an optionally available adhesive sheet for attachment. This is suited to tasks that involve a relatively light load, such as plate engraving.



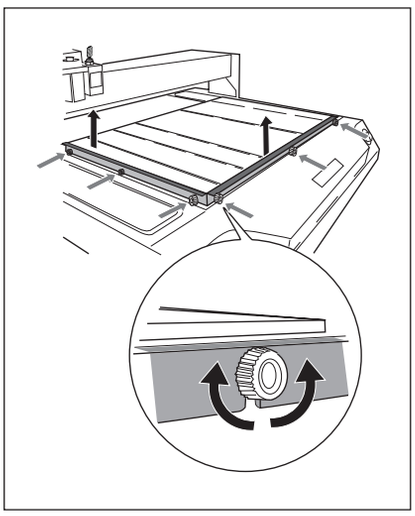
Center vise

This method uses an optionally available center vise for securing in place.



The Loaded Position of the Workpiece

You may load the workpiece anywhere on the table.
Butting the workpiece against the guide is a handy way to ensure that the workpiece is always loaded at the same position. Adjust the height of the guide to match the thickness of the workpiece.



Setting the Reference Point for the Cutting Position

This machine lets you freely change the cutting position. The place where you should set the reference point for the cutting position changes according to how the data was created with the program. Always loading material at the same location and keeping the reference point for the cutting position on the machine fixed may make positioning easier.
The reference point for cutting is the location where the X- and Y-axis coordinates are both zero (that is, the X- and Y-axis origin point). This is also called the home position. This is initially set at the front left of the table.

1. Setting the Home Position

❶ Move the spindle to the location you want to be the reference point for the cutting position.

❷

```
SET HOME POS
<     0 > <     0 >
```

Press XY ORIGIN SET, then press ENTER PAUSE.

❸

```
X     0   Y     0
Z     0   8000RPM
```

Press MENU to return to the top screen.

Chapter 4 Performing Cutting Using a Computer

This chapter describes how to perform cutting using a computer. It explains important notes when sending commands from a computer, differences among programs in how to make the setting for the cutting parameters, and the procedures for installing and setting up the included programs.

4-1 Procedures for Performing Cutting Using a Computer

Before you send cutting commands from a computer, you first need to set the cutting parameters. You make the settings for cutting-in depth, feed rate, spindle speed, and other values to match the cutter and the workpiece. The method you use to make the settings differs from one program to another.

Point

For more information on how to set the cutting parameters

☞ See p.61 "Setting the Cutting Parameters"

This machine starts operating immediately when it receives commands from a computer. However, you should close the spindle cover before sending commands. For safety, the machine does not operate while the cover is open.

4-2 Setting the Cutting Parameters

Types of Cutting Parameters

You can make the settings for the following five cutting parameters on this machine.

- Spindle rotating speed
- Feed rate in the X- and Y-axis directions
- Feed rate in the Z-axis direction
- Cutting-in depth (Z1)
- Amount of cut-out during feed while raised (Z2)

You can make the settings for these either on the machine by using the menus, or by using the program. When you make a setting both on the machine and in the program, the program's setting is the one that takes effect. This means there is no point in making the same setting both on the machine and with the program.

Differences in Setting Items Between Programs

Programs may differ in how many of the five cutting parameters they let you set. Some programs may allow you to make the settings for all five, but with others it is necessary to make some of the settings on the machine. For information about what settings must be made on the machine, refer to the program's documentation.
Also, with some programs for solid, three-dimensional cutting, flat parameters such as the cutting-in depth and the cut-out amount have no meaning. Making the Settings on the Machine

Cutting Parameters	Dr.Engrave (2.5D driver)	3D Engrave	Example of another program
Spindle rotating speed	Program	Program	Machine
X- and Y-axis feed rate	Program	Program	Program
Z-axis feed rate	Program	Program	Machine
Cutting-in depth	Program *	Not valid	Machine *
Cut-out amount	Program *	Not valid	Machine *

* This setting is generally not required when using the nose unit or a diamond scraper.

☞ See p.43 “Cutting Parameters When Using the Nose Unit”
☞ See p.52 “Cutting Parameters for the Diamond Scraper”

Making the Settings on the Machine

Spindle Rotating Speed

Setting the Spindle Rotating Speed

❶

Press MENU several times to display the screen shown at right.

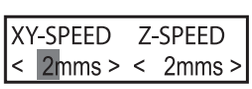
❷ Use ▲ ▼ to set the spindle speed, then press ENTER/PAUSE.

Point

You can also change the spindle speed while at the top screen, by turning the dial. Note, however, that when the machine is turned off, the spindle speed returns to the value you set using the procedure described above.

Feed Rate

Setting the Feed Rate

❶ 

Press MENU several times to display the screen shown at right.

❷ Press ◄ ► to move the blinking cursor to [XY-SPEED] or [Z-SPEED].
[XY-SPEED] sets the X- and Y-axis feed rate, and [Z-SPEED] sets the Z-axis feed rate.

❸ Use ▲ ▼ to set the feed rate, then press ENTER/PAUSE.

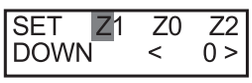
Point

You can change the feed rate while cutting is in progress. Follow the steps below to make the change.

① While cutting is in progress, press ENTER/PAUSE. Cutting pauses.
② Press MENU. The screen shown in step 2 described above appears. Make the appropriate setting.
③ Press MENU, then press ENTER/PAUSE. Cutting resumes at the new feed rate.

Cutting-in Depth and Cut-out Amount

Setting the Cutting-in Depth

❶ 

Press ORIGIN SET Z. Press ◄ to move the blinking cursor to [Z1].

❷ Use +Z -Z to set the cutting-in amount. If the value is [------], then hold down -Z until it changes to a numerical value.
At this time the spindle moves up and down and the position when cutting-in is performed (the Z1 position) is displayed. You can set the cutting-in depth as you verify the actual Z1 position.

❸ Press ENTER PAUSE.

Point

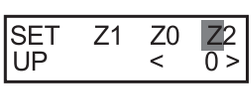
Important Notes on Setting the Cutting-in Depth

The cutting-in depth is a setting that indicates the amount of lowering from the Z-axis reference point (the Z0 position). If the Z0 position changes, then the cutting-in position (the Z1 position) also changes by a corresponding amount. The Z1 position cannot be set above the Z0 position. When the spindle is above the Z0 position, the value displayed is [------], indicating that the setting cannot be made at this position.

Unit of Measurement for the Numerical Values

The measurement unit for the displayed values is 0.01 mm. When [-20] is displayed, for example, the cutting-in amount is 0.2 mm.

Setting the Cut-out Amount

❶ 

Press ORIGIN SET Z. Press ► to move the blinking cursor to [Z2].

❷ Use +Z -Z to set the cut-out amount. If the value is [------], then hold down +Z until it changes to a numerical value.
At this time the spindle moves up and down and the position of cut-out (the Z2 position) is displayed. You can set the cut-out amount as you verify the actual Z2 position.

❸ Press ENTER PAUSE.

Point

Important Notes on Setting the Cut-out Amount

The cut-out amount is a setting that indicates the amount of rise from the Z-axis reference point (the Z0 position). If the Z0 position changes, then the cut-out position (the Z2 position) also changes by a corresponding amount.
The Z2 position cannot be set below the Z0 position. When the spindle is below the Z0 position, the value displayed is [------], indicating that the setting cannot be made at this position. This means that you cannot set a cut-out amount when the Z0 position is at the highest point on the Z axis.

Unit of Measurement for the Numerical Values

The measurement unit for the displayed values is 0.01 mm. When [100] is displayed, for example, the cut-out amount is 1 mm.

4-3 Installation and Overview of the Included Software

Software Included with the Machine

The included Roland Software Package CD-ROM contains the following programs. Install and set them up as required.

Dr.Engrave	This program is for flat engraving of nameplates and the like. It can use any TrueType fonts registered with Windows. It also comes with its own stroke fonts. You can even import images and engrave items such as logos. There is even a feature that lets you import data from a list of names and engrave nameplates one after another.
3D Engrave	This program is for designing and engraving reliefs (raised engravings). This lets you easily add thickness to text, shapes, and imported images, and create three-dimensional reliefs.
MODELA Player	This program is for freely cutting three-dimensional shapes. You cannot perform designing using this program alone. MODELA 3D Design and MODELA 3D Text are included.
2.5D driver	This is a Windows-based driver required for sending data from a computer to the machine. Be sure to install it when you are using any of the programs just described.
Virtual MODELA	This program is for performing simulations before you actually carry out cutting using 3D Engrave or MODELA Player. It lets you verify the finished results for shapes, the time required for cutting, and other factors. This can help reduce loss in terms of material and time.

This document does not explain how to use these programs. For information about program operation, refer to other documentation such as the manuals in electronic format found on the CD-ROM.

☞See p.4 "Documentation Included with the Machine"

Installation and Setup

System Requirements

Operating system	Windows 95/98/Me/NT4.0/2000/XP
Computer	Computer running Windows (Pentium processor or better recommended)
Drive	CD-ROM drive
Monitor	Windows-compatible monitor capable of displaying 256 colors or more
Memory (RAM)	32 MB or more recommended
Free hard-disk space required for installation	32 MB
Interface	Printer poty or COM port

Installation and Setup

Installation and Setup

❶ Switch on the computer and start Windows.If you are installing under Windows NT 4.0/2000/XP, log on to Windows as a member of the "Administrators" or "Power Users" group.

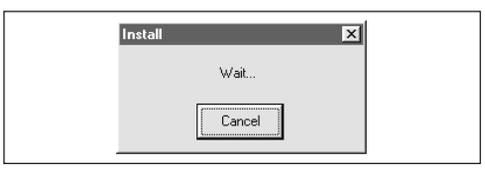
❷ Place the CD from the Roland Software Package in the CD-ROM drive.
The Setup menu appears automatically.

❸

Roland Software Package
Roland
Roland Software Package
for PICZA, MODELA, CAMM-2, CAMM-3
EGX-600
Install
MODELA
Virtual MODELA
Dr.Engrave
3D Engrave
Windows Driver
Step 1
Click the drop-down arrow for [Click here.] and choose the model name.
Step 2
Click [Install].
To view the description of a program, click the [i] button. To view the manual, click the [?] button.
(There are manuals in PDF format for the programs that the [?] button references. Acrobat Reader is required to view PDF files.)
Go to Roland DG Corporation Homepage

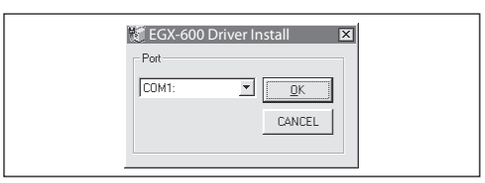
Click the ▼ in [Click here], then choose [EGX-600] or [EGX-400]. Click [Install].
If there are programs you don't want to install, then clear their check boxes before you click [Install].

❹



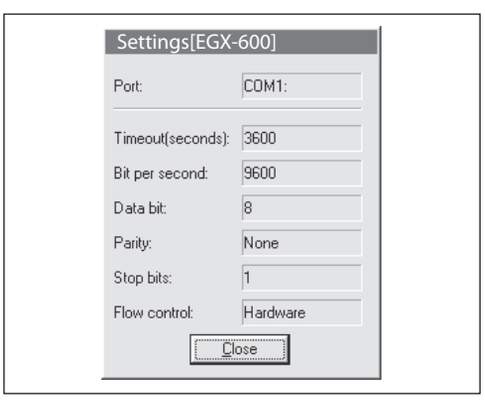
The Setup program starts. Follow the messages to carry out setup and finish setting up the program.
When the setup for one program finishes, the setup for the next program starts. In the interval until the next setup starts, a dialog box showing the progress of processing is displayed.

❺



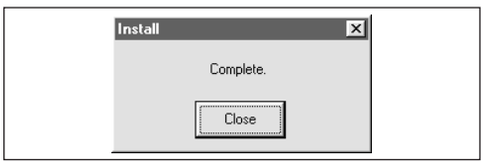
If the following screen appears while installing the driver, click the drop-down arrow and choose the port for the cable connected to the computer.
When using a serial cable : [COM1:] or [COM2:]
When using a printer cable : [LPT1:]

❻



The driver settings appear. When you make the settings for the communication parameters of this machine, make the parameters match the values displayed here.
Click [Close] to finish installing the driver.

(Continued on the next page)

❼ 

When all installation finishes, the screen shown at right appears. Click [Close].

❽

After returning to the menu screen for installation, click ×.

❾ Remove the CD-ROM from the CD-ROM drive.

4-4 Executing Cutting Data Saved on a Memory Card

Working with Cutting Data on a Memory Card

You can take cutting commands sent from the computer and save them as data. You can then save this data on a memory card and import it into the machine. This means that you can receive data with a memory card in exactly the same way as receiving commands from a computer via a connector cable.
This lets you distribute cutting data using just a memory card, making it possible to operate a number of machines in locations where no computer is available.

Requirements for Saving Cutting Data

To save cutting data on a memory card, you use a commercially available memory-card writer. Saving Cutting Data

Point

☞ See p.33 "Memory-card Writers You Can Use"

Saving Cutting Data

First, connect the memory-card writer to your computer running Windows. For information about how to make the connections, refer to the documentation for the memory-card writer.
This section describes how to use the included programs to save data on a memory card.

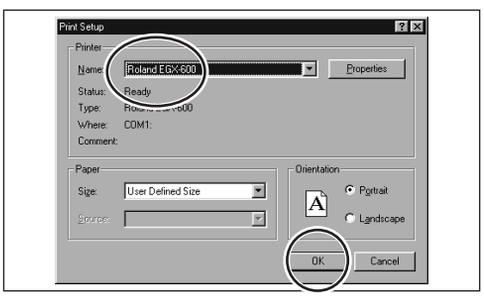
Saving from Dr. Engrave

To save cutting data output from the included Dr. Engrave engraving program on a memory card, follow the steps below.

Saving from Dr. Engrave

❶ Load a memory card into the memory-card writer.

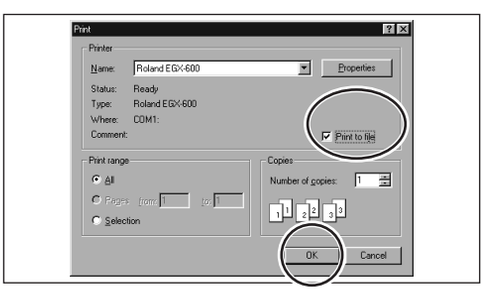
❷



Start Dr. Engrave, go to the [File] menu, and click [Print Setup]. Choose the EGX-400 or the EGX-600, then click [OK].

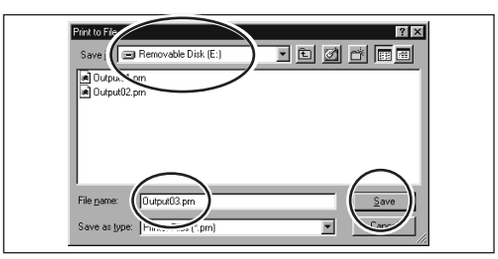
❸ Create the design to engrave, then go to the [File] menu and click [Print].
The [Print] dialog box appears.

❹



Select the [Print to File] check box, then click [OK].
The [Print to File] dialog box appears.

❺



For [Save in], select the memory-card drive. Type in a file name, then click [Save].
The cutting data is saved on the memory card.

Point

Use a file name of eight characters or fewer, with a file extension of three characters or fewer. File names that do not meet these criteria are not displayed correctly on the machine.
Do not try to save in a subdirectory. This machine does not recognize subdirectories.

Detailed Information About File Names

☞See p.72 "Important Notes When Saving Cutting Data"

Saving from Another Program

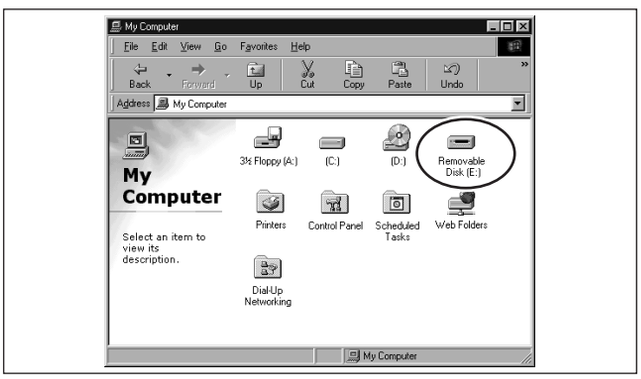
For a program such as the included 3D Engrave, follow the steps below. You can also use this method with other programs (as long as the other program uses a driver for Windows).

Saving from Another Program

❶ If you are using Windows NT 4.0/2000/XP, log on to Windows as a member of the "Administrators" or "Power Users" group.

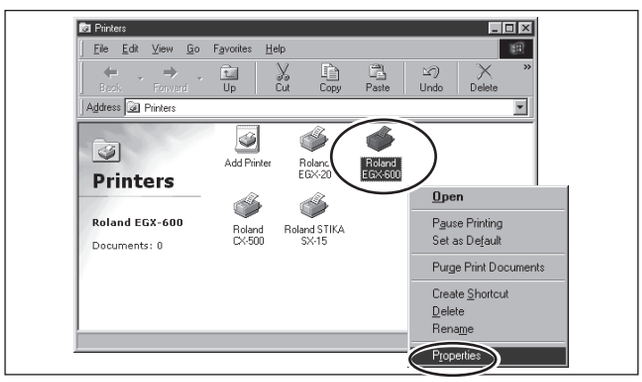
❷ Load a memory card into the memory-card writer.

❸



Open [My Computer]. Note the drive name of the memory card.
In the example shown in the figure, the drive name is "E:."

❹



For Windows 95/98/Me/NT 4.0/2000:
Click [Start], then [Settings]. Then click [Printers].

For Windows XP:
Click [Start], then click [Control Panel].
Click [Printers and Other Hardwares], then click [Printers and Faxes].

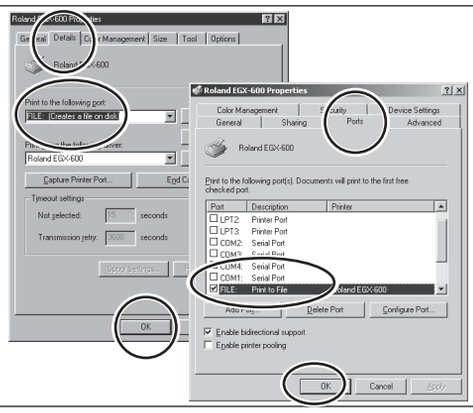
❺ Right-click the icon for the EGX-600 or EGX-400 driver, then click [Properties].

(Continued on the next page.)

❻ For Windows 95/98/Me:
Click the [Details] tab.

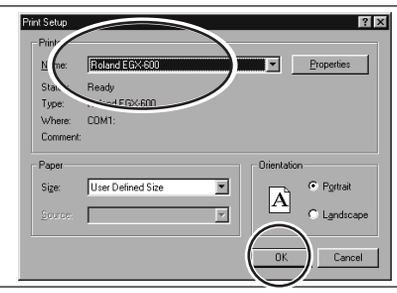
For Windows NT 4.0/2000/XP:
Click the [Ports] tab.

❼



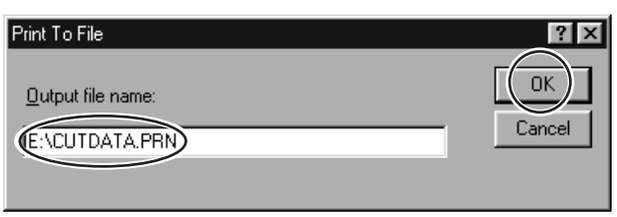
Make a note of what is selected for [Print to the following port] or [Port] (this may be [LPT1:], [COM1:], or the like). Next, change this to [FILE:]. Click [OK].

❽



Start the program and select the EGX-600 or the EGX-400 as the output destination. Create the design to cut, then perform output.
The [Print to File] dialog box appears.

❾



For [Output file name], type in the memory-card drive name you noted in step 3, followed by a backslash (\) and a file name.
① For example, if the drive name is "E:" and you want to use "CUTDATA.PRN" as the file name (with the file extension), then type in "E:\CUTDATA.PRN" here.

② Click [OK].
The cutting data is saved on the memory card.

Point

Use a file name of eight characters or fewer, with a file extension of three characters or fewer. File names that do not meet these criteria are not displayed correctly on the machine.
Do not try to save in a subdirectory. This machine does not recognize subdirectories.

Detailed Information About File Names
☞See p.72 "Important Notes When Saving Cutting Data"

❿ Follow steps 4 to 7 to restore the port to the setting you noted down in step 7.

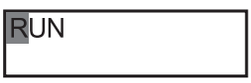
Importing and Executing Memory-card Data

To operate the machine using cutting data saved on a memory card, follow the steps below.

Importing and Executing Data

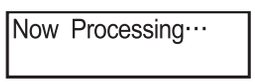
❶ Insert the memory card on which cutting data is saved into the memory-card slot.

❷



Press MENU several times until the screen shown at right appears. Make sure the blinking cursor is at [RUN], then press ENTER PAUSE.
The screen for selecting the file appears.

Notice



There may be a slight delay of several seconds to several dozen seconds until the file-selection screen appears. During this time, do not try to remove the memory card or switch off the power.

❸

Turn the dial to display the file name for the cutting data that you want to import. Press ENTER PAUSE.
The cutting data is imported and operation starts.

Point

The execution of cutting data is exactly like operation when commands are received from a computer. Coordinate values are displayed during execution, and the pause menu is also available. Make the settings for the home position, the Z0 position, and cutting parameters using the same procedures as for when receiving commands from a computer.

Important Notes When Saving Cutting Data

Valid Characters for File Names

Use the following characters for the file names you assign when saving cutting data.

- Letters: A through Z
- Numerals: 0 through 9
- Special characters: $, &, #, %, -, _, ~ (the space character cannot be used)

Also, use a file name of eight characters or fewer, with a file extension of three characters or fewer.
Using a file name that does not meet these criteria may result in character corruption or the file name failing to be displayed on the machine.

A Note on Creating New Folders

The machine does not display files saved in folders (subdirectories) created on a memory card. Cutting data for use with this machine must be saved in the root directory.

The Number of Files That Can Be Saved

This machine can handle up to 512 files saved in the root directory. It is possible to save more than 512 files in a subdirectory, but the machine cannot use them.
Note that the actual number of files that can be saved depends on the available space on the memory card.

Deleting Cutting Data

To delete cutting data, load the memory card into a memory-card writer and drag the file or files you want to delete to the Recycle Bin in Windows.

Chapter 5
The Teaching Feature

This chapter describes how to use the teaching feature. It provides detailed explanations of how to create and save sequences, how to execute the sequences you create, the commands you use, and more.

5-1 Overview of the Teaching Feature

What Is the Teaching Feature?

This feature lets you teach operation instructions directly to the machine without using a computer. You use the operation panel to enter the operation instructions. Each operation instruction that you enter is called a "command," and a collected set of commands is called a "sequence." You can save created sequences in the built-in memory or on a memory card. Once you have made a sequence, you can make the machine move in the specified way whenever you like.
The teaching feature lets you do things like those described below.

Basic Operations Possible with Commands

- Linear movement to specified coordinates (simultaneous three-axis movement is possible)
- Arc movement
- Starting and stopping spindle rotation
- External-equipment control using the expansion connector 2 (input-port monitoring and output-port control)

Positioning Functions

- Registering an optional origin and calling it up in a sequence
- Setting an I level and an R level

Functions for Creating Sequences

- Specifying labels
- Executing conditional branches in programs using jump commands
- Subroutine execution through call commands

Important Notes When Using the Nose Unit

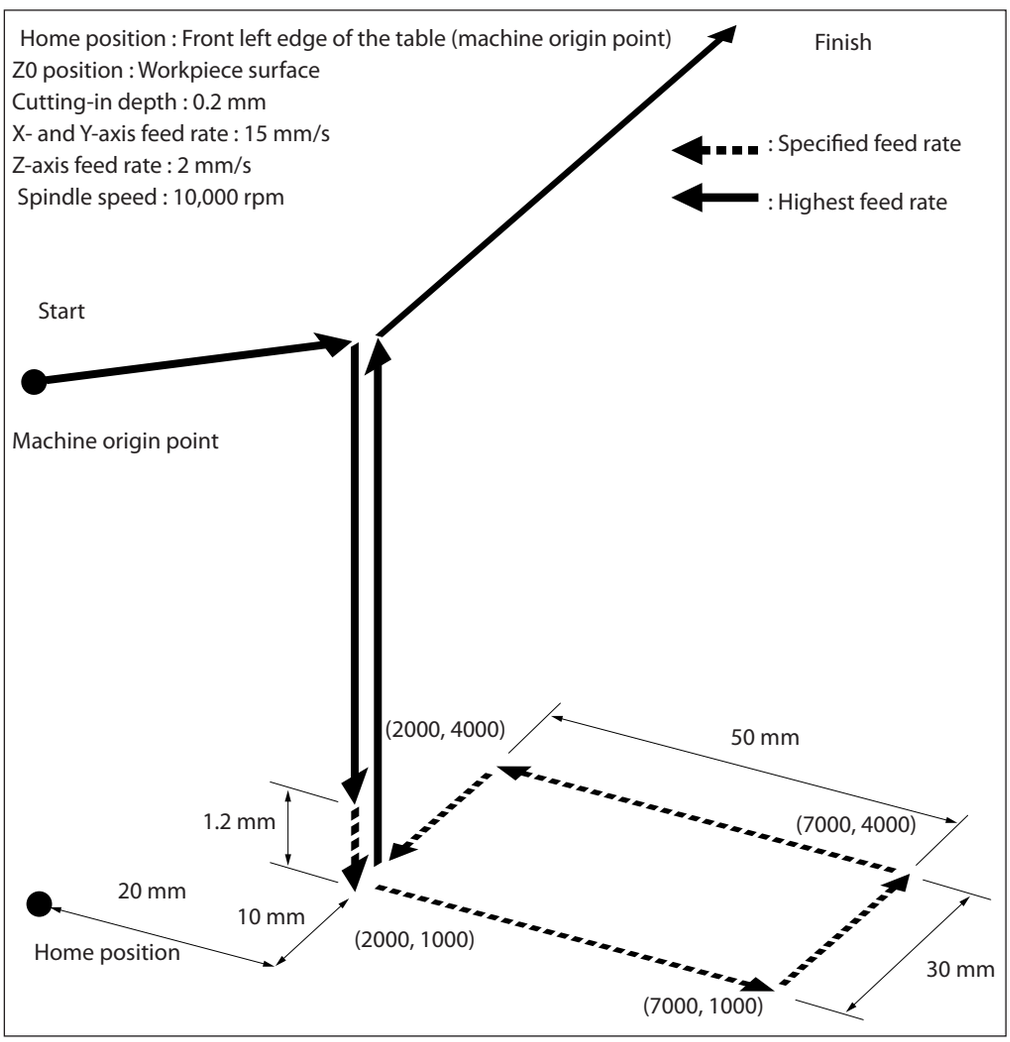
When you use the teaching feature to operate the machine, the [AUTO Z CONTROL] function is disabled. Please note that the cutting-in depth and the amount of cut-out are not set automatically even when you use a nose unit or perform scribing using a diamond scraper. The cutting-in depth and the amount of cut-out must be specified entirely within a sequence.

5-2 Basic Steps for Creating and Executing a Sequence

In this section you learn the basics of using the teaching feature through a explanation of the steps for creating and running a very simple sequence. For details about the functions of each command and about other functions and features, refer to later sections.

Step 1 Decide on the Mode of Operation and the Origin Points

First decide what movement you want to perform. In this example we'll try cutting a quadrilateral, then moving the spindle out of the way.
The important thing here is to decide on the origin points for the X, Y, and Z axes ahead of time. The cutting location changes according to the home position and the Z0 position. It may not be possible to perform the same cutting every time unless you decide on definite origin points. The direction of the approach to the workpiece is also important. You must move to the start point while avoiding the jig or the like used to secure the workpiece in place. That is, you need to consider in advance what kind of jig is to be used to secure the workpiece.



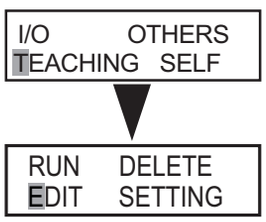
Step 2 Create the Sequence

Now let's actually create the sequence. First carry out operations without loading a workpiece. We'll assume that the Z0 position is set at the surface of the workpiece.

Example of Sequence Creation

1. Entering Sequence Edit Screen.

❶



Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER/PAUSE. Move the blinking cursor to [EDIT], then press ENTER/PAUSE.

❷

Specify creation of a new sequence. Make sure the blinking cursor is at [Yes], then press ENTER/PAUSE.
The sequence editing screen appears.

2. Edit Sequence.

❶

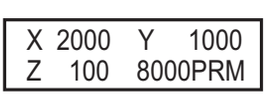
Turn the dial to make the display change to [1 MOVE-LIMIT]. Press ENTER/PAUSE.
You have now finished entering the commands to move the spindle to the machine origin point at the highest speed as the first step. When you finish making the entries for the first step, the display changes to the input screen for the second step.

❷

Turn the dial to make the display change to [10 SP OFF]. Press ▶, then turn the dial to display [ON]. Press ▶ again, then turn the dial to display [100]. Press ENTER/PAUSE.
Now you have entered the commands for rotating the spindle. [100] means rotation at 10,000 rpm. Now the input screen for the third step appears.

❸

① Turn the dial to display [3 MOVE-ZM]. Press ENTER/PAUSE.
The screen changes to the coordinate view.



② Press ▲ ▼ ◀ ▶ to move the X and Y axes to the first cutting point (X 2000, Y 1000). Next, press -Z to move the Z axis to a location 1 millimeter from the surface of the workpiece (Z 100). Press ENTER/PAUSE.
Check the displayed coordinates as you perform movement. Now you have entered the commands for moving the X and Y axes to the specified position, then lowering the Z axis at the highest speed to a position close to the surface of the workpiece. Next, the input screen for the fourth step appears.

❹

```
  4:
8 CUT-3  3
```

① Turn the dial to display [8 CUT-3 2]. Press ▶, then turn the dial to display [3].Press ENTER/PAUSE.
The screen changes to the coordinate view.

```
X 2000   Y   1000
Z   -20  8000PRM
```

② Press -Z to move the Z axis to where it cuts into the workpiece by 0.2 mm (Z -20). Press ENTER/PAUSE.
Now you have entered the commands for cutting into the workpiece at a feed rate of 3 mm/s. Next, the input screen for the fifth step appears.

❺

```
  5:
8 CUT-3  15
```

① Turn the dial to display [8 CUT-3 2]. Press ▶, then turn the dial to display [15]. Press ENTER/PAUSE.
The screen changes to the coordinate view.

```
X 7000   Y   1000
Z   -20  8000PRM
```

② Press ▲ ▼ ◀ ▶ to move the X and Y axes to the (X 7000, Y 1000) point.Press ENTER/PAUSE.
Next, the input screen for the sixth step appears.

❻

```
  6:
8 CUT-3  15
```

In the same way as for steps 9 and 10, input the commands to move to (X 7000, Y 4000), to (X 2000, Y 4000), and to (X 2000, Y 1000).
Now you have entered the commands for cutting a quadrilateral at a feed rate of 15 mm/s. Next, the input screen for the ninth step appears.

❼

```
  9:
3 MOVE-ZM
```

① Turn the dial to display [3 MOVE ZN].
Press ENTER/PAUSE.
The screen changes to the coordinate view.

```
X 2000   Y  40700
Z 4128   8000PRM
```

② Press +Z to raise the Z axis to its upper limit. Then press ▲ to move the Y axis all the way to the back of the table. Press ENTER/PAUSE.
Now you have entered the commands for raising the Z axis to the upper limit, then moving the spindle out of the way. Next, the input screen for the tenth step appears.

❽

```
  10:
< 10  SP  OFF >
```

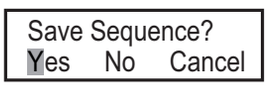
Turn the dial to make the display change to [10 SP OFF]. Press ENTER/PAUSE.
Now you have entered the command for stopping rotation of the spindle. The input screen for the eleventh step then appears, but the procedure is finished. The final step must always be [22 FINISH].

Step 3 Save the Sequence

Next, you save the sequence you have created.

Procedure for Saving a Sequence

❶



Press and hold MENU for a short while (1 second or longer). Press ENTER/PAUSE.
This quits the sequence editing screen and displays the screen for saving a sequence.

❷

Assign a file name. Press ▶ to move the blinking cursor. Turn the dial to select a character, then press ▶ to move to the next character.
You can repeat this to assign a file name of up to eight characters.

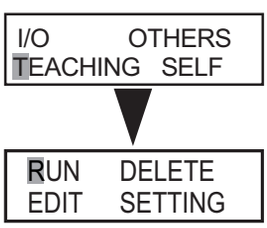
❸ Press ENTER/PAUSE.
The sequence is saved and the machine returns to the teaching menu.

Step 4 Execute the Sequence

Let's try executing the sequence you created. First, to verify the operation, let's execute it without installing a cutter or loading a workpiece.

Procedure for Executing a Sequence

❶



Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER/PAUSE. Move the blinking cursor to [RUN], then press ENTER/PAUSE.

❷

Call up the saved sequence. Turn the dial to select it. Let's try selecting the [TEST] you created earlier.

❸ Press ENTER/PAUSE.
Operation starts. The screen successively displays the commands being executing.

Point

The [Int.] to the left of the file name means the sequence has been saved in the built-in memory. Sequences saved on a memory card are displayed with [Ext.].

5-3 Correcting a Sequence

If You Make a Mistake in Input

You can go back to a previous step and revise it at any time if you discover an input error when creating a sequence. You can also insert steps and delete single steps.

Correcting a Previous Step

❶
```
 11:
< 22  FINISH >
```
Press ▲ to move the blinking cursor to the step number.

❷
```
  5:
 8  CUT-3  78
```
Turn the dial to display the step you want to revise.

❸
```
  5:
 8  CUT-3  15
```
Change a command — Change a value

Press ▼ to move the blinking cursor to the line below. Follow the same procedure as for entering new commands. You can also change the values of commands. When you've finished making the revisions, press ENTER/PAUSE.

❹
```
  11:
< 22  FINISH >
```
Press ▲ to move the blinking cursor to the step number. Turn the dial to move to the final step. Press ▼ to move the blinking cursor to the line below, then resume normal input operations.

Inserting a Step

❶
```
 11:
< 22  FINISH >
```
Press ▲ to move the blinking cursor to the step number.

❷
```
  9 :
< 10  SP  OFF >
```
Turn the dial to move to the location where you want to insert.
The new step is inserted just before the displayed step.

❸
```
  9 :
 INSERT NEW STEP
```
Press ▼ to move the blinking cursor to the line below. Turn the dial to display [INSERT NEW STEP]. Press ENTER/PAUSE.
The new step is inserted. Turn the dial to select the command you want. This is initially set to the [23 DO NOTHING] command.

Deleting a Step

❶

```
 11:
< 22  FINISH >
```

Press ▲ to move the blinking cursor to the step number.

❷

```
  9 :
< 15  BREAK >
```

Turn the dial to display the step you want to delete.

❸

```
  9:
DELETE THIS STEP
```

Press ▼ to move the blinking cursor to the line below. Turn the dial to display [DELETE THIS STEP]. Press ENTER/PAUSE.

Point

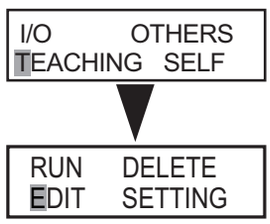
You cannot delete the last step. Every sequence must have at least one [FINISH] command.

Revising a Saved Sequence

You can call up a saved sequence, revise it, and save it again.

Calling Up and Revising a Sequence

❶



Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER PAUSE. Move the blinking cursor to [EDIT], then press ENTER PAUSE.

❷

Press ▶ to move the blinking cursor to [No]. Press ENTER PAUSE.

❸

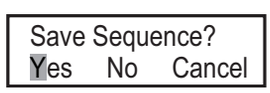
Turn the dial to choose the sequence you want to revise. Press ENTER PAUSE.
The sequence editing screen appears.

Point

The [Int.] to the left of the file name means the sequence has been saved in the built-in memory. Sequences saved on a memory card are displayed with [Ext.].

❹ Use the same procedure described earlier in "If You Make a Mistake in Input" to revise the sequence.

❺



Press and hold MENU for a short while (1 second or longer), then press ENTER PAUSE.

❻

Turn the dial to choose the file to overwrite, then press ENTER PAUSE.

❼

Make sure that it's okay to overwrite, thenpress ENTER PAUSE.
If you want to cancel the save and overwrite operation, use ▶ to move the blinking cursor to [No], then press ENTER PAUSE.

5-4 Detailed Description of the Sequence Editing Screen

This section describes the button operations of the [EDIT] menu in detail, and also explains other practical functions.

Screen Layout and Button Operations

Basic Layout of the Sequence Editing Screen

Step number

This shows the number of the step. You can input up to 1,000 steps per sequence.

Label name

You can assign names to steps as required. These names are called "labels." Labels are used with commands such as [JUMP] wand [CALL].

Command

This is the instruction for operation. When you select a command, the angled brackets ("< >") disappear. Pressing ENTER PAUSE to confirm it and finish input makes the angled brackets appear.

Value

A command may have one or more values. There are also commands that have separate, detailed screens that let you specify even more values.

Main Functions of the Control Buttons

These are some typical functions of the buttons you use for operation. Depending on the command you select, the buttons may also have special functions. For more information about the button operations for each corresponding, see "List of Commands" on p.89.

▲ ▼ ◀ ▶	These move the blinking cursor.
Dial	This is used to increase or decrease the value or to select the command at the location of the blinking cursor. Turning the dial while holding down increases or decreases the value by 100 units at a time.
MENU	Pressing this while a step number is displayed changes the screen to the co-ordinate view. While at this screen, you can move the spindle head and rotate the spindle with the same button operations as when you're at the top screen. You also use this at times such as when you want to verify the position of the spindle head while you're creating a sequence. Also, holding it down for a short while (one second or longer) ends sequence creation. Pressing this at any other screen cancels input.
ENTER PAUSE	This enables what you have input. You also use it to go to a detailed screen, depending on the command.

Setting a Label

A label is used to specify the jump destination for [JUMP], [J], [CALL], and [C] commands. When you use any of these commands, you must be sure to assign a label. If you try to save a sequence without assigning a required label, the machine displays [INPUT LABEL NAME], then returns to the sequence editing screen.

Setting a Label

❶

At the sequence editing screen, display the step where you want to assign a label.

❷

Use ► to move the blinking cursor to the location shown in the figure.

❸

Turn the dial to select a character, then press ► to move to the next character. You can assign a label name of up to five characters by repeating this operation.

❹

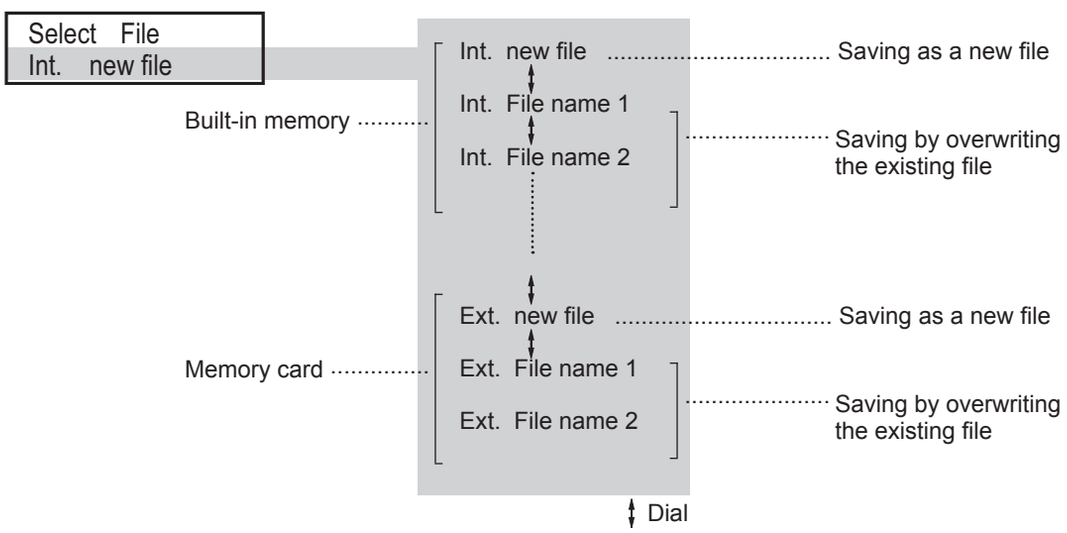
Press ENTER/PAUSE.

5-5 Detailed Information on Saving a Sequence

Destinations for Saving Sequences

You can save sequences either in the machine's built-in memory or on a memory card. You can save up to ten sequences in the built-in memory. The number you can save on a memory card varies according to the card's capacity. Note that the maximum is 512.

Specify either the built-in memory or a memory card for saving or calling up a file. A file displayed with [Int.] is in the machine's built-in memory, and one displayed with [Ext.] is on a memory card.
When saving a file, if you want to save it as a new file with a different name, select [new file], then enter the file name. If you want to save it by overwriting the existing file, select the name of the existing file. When you do this, a prompt is displayed to confirm that you want to overwrite the file.



Overwrite File?
Yes No

A prompt to confirm overwriting is displayed.

Notice

There may be a slight delay of several seconds to several dozen seconds until the file-selection screen appears. During this time, do not try to remove the memory card or switch off the power.

Now Processing...

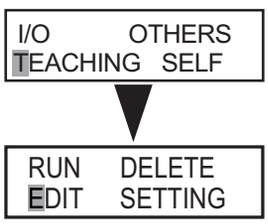
Backing Up a Sequence

You can back up sequence saved in the machine's built-in memory to a memory card. Back up important data to a memory card.

Backing Up from the Built-in Memory to a Memory Card

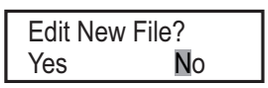
❶ Insert a memory card into the machine's memory-card slot.

❷



Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER/PAUSE. Move the blinking cursor to [EDIT], then press ENTER/PAUSE.

❸

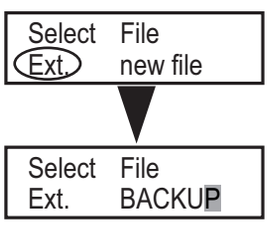


Press ► to move the blinking cursor to [No]. Press ENTER/PAUSE.

❹

Turn the dial to select a sequence saved in the built-in memory. Press ENTER/PAUSE.
The sequence editing screen appears.

❺



Press and hold MENU for a short while (1 second or longer), then press ENTER/PAUSE. Turn the dial to select the memory card as the destination for saving. Also, assign a file name here.

❻ Press ENTER/PAUSE.

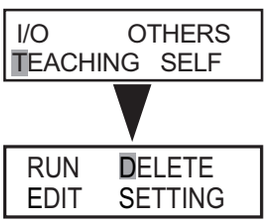
A backup copy of the sequence is saved on the memory card. Deleting a Sequence
You can delete saved sequences.

Deleting a Sequence

You can delete saved sequesnces.

Deleting a Sequence

❶

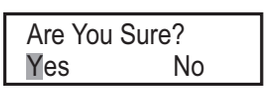


Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER PAUSE. Move the blinking cursor to [DELETE], then press ENTER PAUSE.

❷

Turn the dial to choose the sequence you want to delete. Press ENTER PAUSE.

❸



Move the blinking cursor to [Yes], then press ENTER PAUSE.
The sequence you selected is deleted.

5-6 Coordinate Systems Used with the Teaching Feature

Cutting Positions Used with the Teaching Feature

The origin points used with the teaching feature are basically the same as the ones used when you perform cutting with a computer. That is, the cutting position is based on the home position and Z0 position (workpiece origin) set with the machine. The coordinates for movement destinations specified by commands such as [MOVE-ZM] and [CUT 3] are all workpiece coordinates.

Point

About Workpiece Coordinates

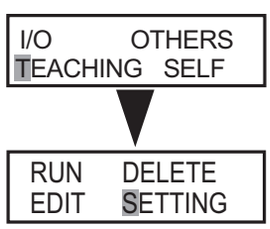
☞ See p.104 "Coordinate Systems and Origin Points"

Optional Origins

In addition to the workpiece origin point there is a special origin point used only with the teaching feature. This is called the "optional origin." Choosing an optional origin with the [SEL ORG] command makes the cutting position change, and operations thereafter use the optional origin as the reference point.
You need to register an optional origin ahead of time. You can register up to 99, from No. 2 to No. 100.
One important matter about optional origins that you need to give attention to is that the position of an optional origin is determined using the workpiece origin point as the reference point. If you change the home position or the Z0 position, the location of the optional origin also changes accordingly. This means that you can modify the locations of all 99 optional origins at once.

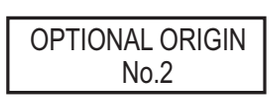
Registering an Optional Origin

❶



Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER PAUSE. Move the blinking cursor to [SETTING], then press ENTER PAUSE.

❷

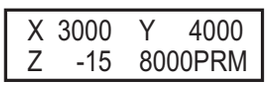


Turn the dial to choose the number for the optional origin you want to register. Press ENTER PAUSE.
The screen changes to the coordinate view. These are relative coordinates (workpiece coordinates) that are referenced to the home position and Z0 position.

Point

You can check the coordinate values of the registered optional origins at this time by pressing ▶ instead of ENTER PAUSE. To go back to the original screen, press ◀. When nothing has been registered, the display shows (X 0, Y 0, Z 0). That is, it is the same as the location of the workpiece origin point.

❸



Use ▲ ▼ ◀ ▶ +Z -Z to move the X, Y, and Z axes to the location you want to make the optional origin. Press ENTER/PAUSE.

This registers a single optional origin. To cancel and return, press MENU instead of ENTER/PAUSE.

❹ Repeat steps 2 and 3 as to register a second and third optional origin. When you're done, press MENU several times to go back to the top screen.

I Level and R Level

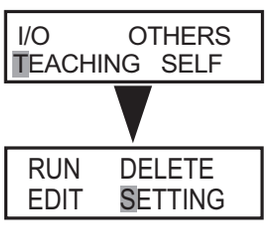
These are special points used for positioning the Z axis. You use them only with the teaching feature. They are used with the [MOVE-ZI], [CUT-ZM], and [CUT-ZI] commands. When you use any of these commands, you need to register the I level and R level in advance.

The I level and the R level both take the Z0 position as their reference point. If the Z0 position changes, the locations of the I level and R level also change accordingly. Also, selecting an optional origin in a sequence using the [SEL ORG] command makes the I level and R level change to locations that reference the selected optional origin.

Using these makes it simple to change such things as the distance for operating the Z axis at the highest speed, and lets you make fine adjustments to perform operations with less wasted effort. This can help make for efficient cutting as a result.

Registering the I Level and R Level

❶



Press MENU several times to display the screen shown at right, then move the blinking cursor to [TEACHING]. Press ENTER/PAUSE. Move the blinking cursor to [SETTING], then press ENTER/PAUSE.

❷

Press MENU several times to display the screen shown at right. Move the blinking cursor to either [I LEVEL] or [R LEVEL], then use ▲ ▼ to raise or lower the value.

This value indicates the number of steps above (positive value) or below (negative value) the Z0 position. As with coordinate values, one step is 0.01 mm.

❸ Press ENTER/PAUSE.

The I level and R level locations are registered.

5-7 List of Commands

This section describes in detail all the commands you can use with the teaching feature. Refer to this section when you want detailed information about how to screen a command, including screen displays and button operations.

1 MOVE-LIMIT

Function This moves the spindle head to the machine origin point.
Value None

This moves the spindle at the highest speed. It raises the spindle to the upper limit, then moves it to the location all the way at the front-left of the table. This command has no function for rotating or stopping the spindle.

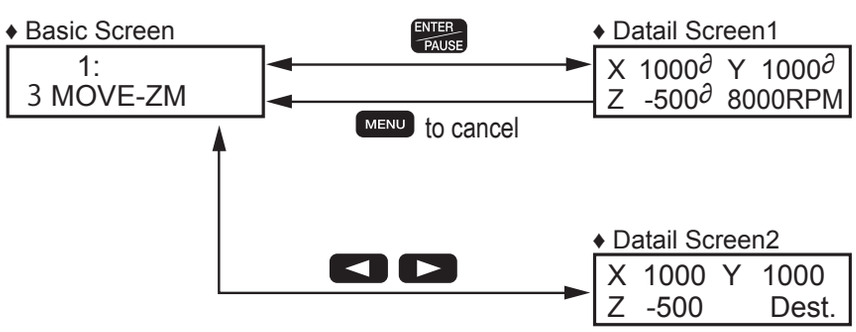
2 MOVE-ORG

Function This moves the spindle head to the home position
Value None

This moves the spindle at the highest speed. It first raises the spindle to the upper limit. Then it moves to the home position (the workpiece origin point for the X and Y axes). (When an optional origin has been selected using the [SEL ORG] command, however, the X and Y axes move to that position.) This command has no function for rotating or stopping the spindle.

3 MOVE-ZM

Function This moves the spindle head to the specified X, Y, and Z coordinates.
Value ∂ X, Y, and Z coordinates for the movement destination



This moves the spindle at the highest speed. The operation is as follows.
1. Move the Z axis to the upper limit.
2. Move to the specified X and Y coordinates.
3. Move to the specified Z coordinate.

This command has no function for rotating or stopping the spindle.

➢ Detail Screen 1

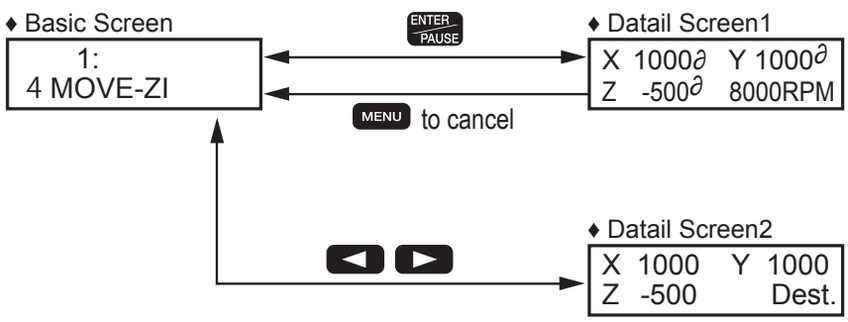
Specify the X, Y, and Z coordinates for the movement destination. At this screen you can use button operations to move or rotate the spindle. You can decide on the movement destination as you verify the on-screen coordinate values and the actual position. To set the present location of the spindle as the movement destination, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 2

This displays the X, Y, and Z coordinates of the set movement destination. Use this screen to verify the settings.

4 MOVE-ZI

Function This moves the spindle head to the specified X, Y, and Z coordinates (via the I level).
Value ∂ X, Y, and Z coordinates for the movement destination



This moves the spindle at the highest speed. The operation is as follows.

1. Move the Z axis to the height specified for [I LEVEL] at the [SETTING] submenu.
2. Move to the X and Y coordinates specified here.
3. Move to the Z coordinate specified here.

This command has no function for rotating or stopping the spindle.

➢ Detail Screen 1

Specify the X, Y, and Z coordinates for the movement destination. At this screen you can use button operations to move or rotate the spindle. You can decide on the movement destination as you verify the on-screen coordinate values and the actual position. To set the present location of the spindle as the movement destination, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

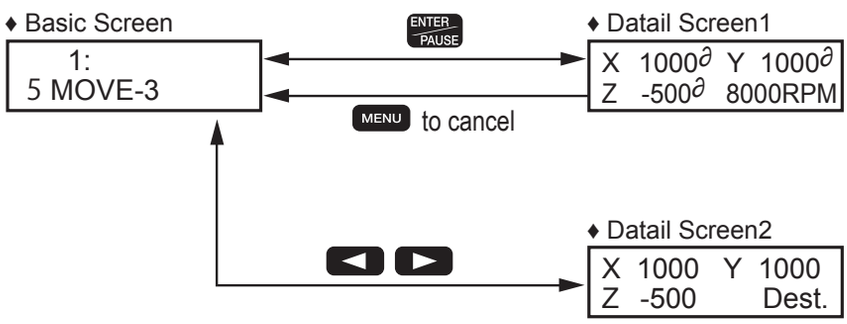
➢ Detail Screen 2

This displays the X, Y, and Z coordinates of the set movement destination. Use this screen to verify the settings.

5 MOVE-3

Function This moves the spindle head to the specified X, Y, and Z coordinates, moving all three axes simultaneously.

Value ∂ X, Y, and Z coordinates for the movement destination



This moves the spindle at the highest speed. It moves all three axes simultaneously to the specified X, Y, and Z coordinates. Unlike [MOVE-ZM], it effects linear movement to the specified X, Y, and Z coordinates. This command has no function for rotating or stopping the spindle.

➢ Detail Screen 1

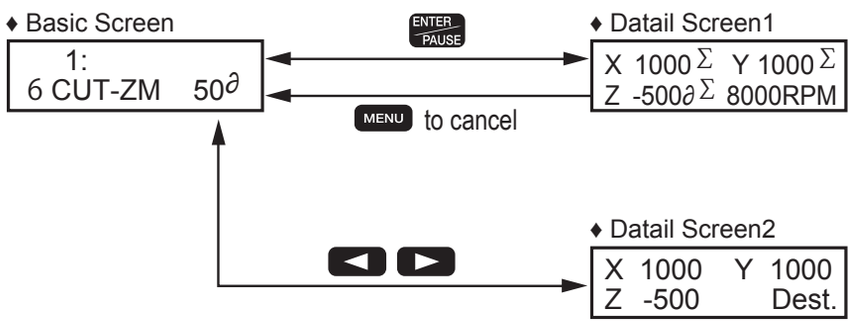
Specify the X, Y, and Z coordinates for the movement destination. At this screen you can use button operations to move or rotate the spindle. You can decide on the movement destination as you verify the on-screen coordinate values and the actual position. To set the present location of the spindle as the movement destination, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 2

This displays the X, Y, and Z coordinates of the set movement destination. Use this screen to verify the settings.

6 CUT-ZM

Function This moves the spindle head to the specified X, Y, and Z coordinates (at the specified feed rate and via the R level). Z-axis feed rate (0 to 50 mm/s)
Value ∂ X, Y, and Z coordinates for the movement destination



This moves the spindle. The operation is as follows.
1. Move at the highest speed to the upper limit of the Z axis.
2. Move at the highest speed to the X and Y coordinates specified here.
3. Move the Z axis at the highest speed to the height specified for [R LEVEL] at the [SETTING] submenu.
4. Move at the specified speed to the Z coordinate specified here.

This command has no function for rotating or stopping the spindle.

➢ Basic Screen

Specify the Z-axis feed rate to use when moving from the R level to the specified Z-axis coordinate. Specifying [0] sets a speed of 0.5 mm/s. After you input the speed, press the [ENTER/PAUSE] button to go to the settings at Detail Screen 1.

➢ Detail Screen 1

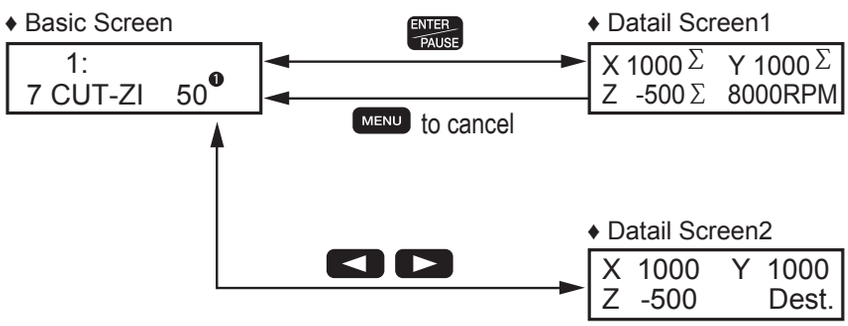
Specify the X, Y, and Z coordinates for the movement destination. At this screen you can use button operations to move or rotate the spindle. You can decide on the movement destination as you verify the on-screen coordinate values and the actual position. To set the present location of the spindle as the movement destination, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 2

This displays the X, Y, and Z coordinates of the set movement destination. Use this screen to verify the settings.

7 CUT-ZI

Function This moves the spindle head to the specified X, Y, and Z coordinates (at the specified feed rate, and via the I and R levels).
Value ∂ Z-axis feed rate (0 to 50 mm/s)
Value ∑ X, Y, and Z coordinates for the movement destination



This moves the spindle. The operation is as follows.
1. Move the Z axis at the highest speed to the height specified for [I LEVEL] at the [SETTING] submenu.
2. Move at the highest speed to the X and Y coordinates specified here.
3. Move the Z axis at the highest speed to the height specified for [R LEVEL] at the [SETTING] submenu.
4. Move at the specified speed to the Z coordinate specified here.

This command has no function for rotating or stopping the spindle.

➢ Basic Screen

Specify the Z-axis feed rate to use when moving from the R level to the specified Z-axis coordinate. Specifying [0] sets a speed of 0.5 mm/s. After you input the speed, press the [ENTER/PAUSE] button to go to the settings at Detail Screen 1.

➢ Detail Screen 1

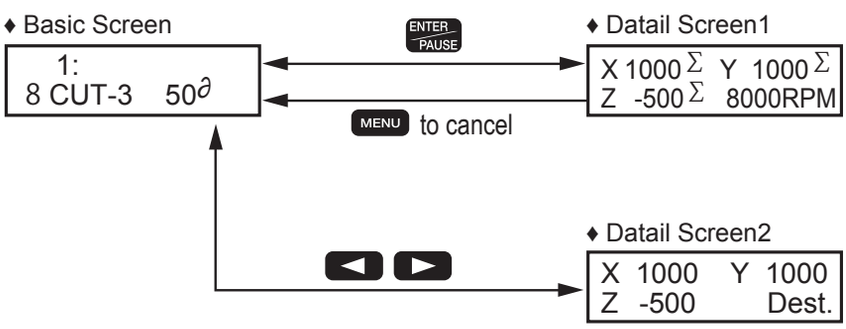
Specify the X, Y, and Z coordinates for the movement destination. At this screen you can use button operations to move or rotate the spindle. You can decide on the movement destination as you verify the on-screen coordinate values and the actual position. To set the present location of the spindle as the movement destination, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 2

This displays the X, Y, and Z coordinates of the set movement destination. Use this screen to verify the settings.

8 CUT-3

Function This moves the spindle head to the specified X, Y, and Z coordinates, moving all three
Value ∂ axes simultaneously (at the specified feed rate).
Value ∑ Feed rate (0 to 50 mm/s). X, Y, and Z coordinates for the movement destination



This moves the spindle at the specified feed rate. It moves all three axes simultaneously to the specified X, Y, and Z coordinates. Unlike [CUT-ZM] and [CUT-ZI], it effects linear movement to the specified X, Y, and Z coordinates. This command has no function for rotating or stopping the spindle.

➢ Basic Screen

Specify the feed rate. Specifying [0] sets a speed of 0.5 mm/s. After you input the speed, press the [ENTER/PAUSE] button to go to the settings at Detail Screen 1.

➢ Detail Screen 1

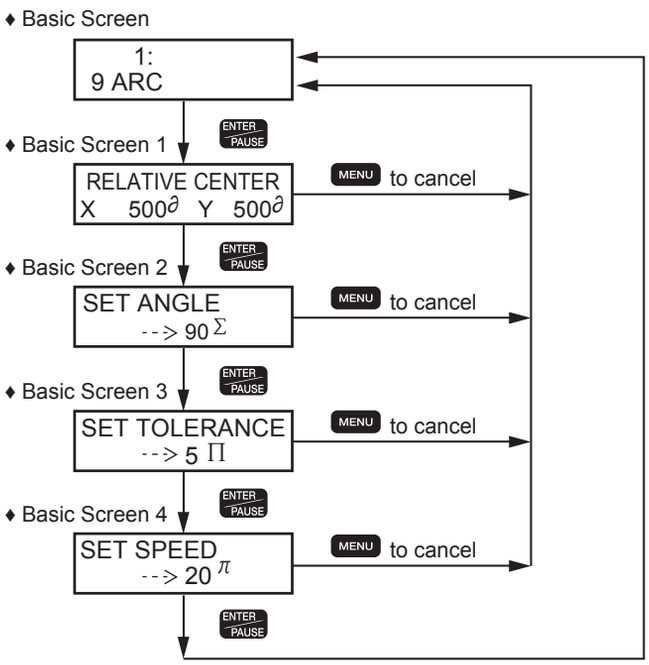
Specify the X, Y, and Z coordinates for the movement destination. At this screen you can use button operations to move or rotate the spindle. You can decide on the movement destination as you verify the on-screen coordinate values and the actual position. To set the present location of the spindle as the movement destination, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

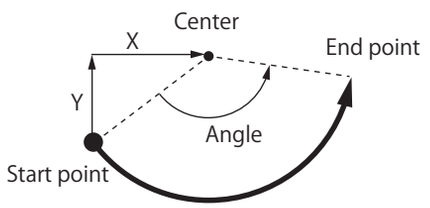
➢ Detail Screen 2

This displays the X, Y, and Z coordinates of the set movement destination. Use this screen to verify the settings.

9 ARC

Function This moves the spindle head in an arc.
Value ∂ Relative location from the start point to the center of the circle (X and Y coordinates)
Value ∑ Angle from the arc start point to end point (-360 to 360 deg.)
Value ∏ Resolution (0 to 120 deg.)
Value π Feed rate (0 to 50 mm/s)





This moves from the present location in an arc of the specified angle. Arc movement is possible only on the X and Y plane.

➢ Detail Screen 1

Specify the center of the circle. Specify relative coordinates from the present location, which is the start point. Note that these are not coordinates referenced to the workpiece origin point. To go to Detail Screen 2, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 2

Specify the angle from the start point to the end point. The direction of turning is determined by whether the value is positive or negative. A positive value yields counterclockwise turning and a negative value yields clockwise turning. To go to Detail Screen 3, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 3

Specify the resolution (smoothness) of the arc. Smaller values result in greater smoothness, but the apparent feed rate becomes slower. Specifying [0] sets the machine's highest resolution. To go to Detail Screen 4, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

➢ Detail Screen 4

Specify the feed rate. Specifying [0] sets a speed of 0.5 mm/s. To finish setting the value, press the [ENTER/PAUSE] button. To cancel and return, press the [MENU] button.

10 SP

Function This makes the settings for rotating or stopping the spindle, and for spindle rotating speed.
Value ∂ Rotation or no rotation (ON: rotation, OFF: stopped)
Value ∑ Spindle rotating speed (80 to 300 x 100 rpm)

```
 1:
10  SP   ON∂  80 Σ
```

This rotates the spindle at the specified spindle rotating speed, or stops rotation of the spindle. Commands to move the spindle, such as [MOVE-ZM] and [CUT-ZM], do not rotate or stop the spindle by themselves. You specify this with the [SP] command. A setting of [80], for example, sets a spindle rotating speed of 8,000 rpm.

11 P

Function This controls the state of the output ports for expansion connector 2.
Value ∂ Output-port state (1: High, 0: Low, *: Maintain state)

```
 1:
11  P   00000000∂
```

```
00000000
 /     \
Output port 1    Output port 8
```

This command changes the state of the output ports for expansion connector 2. There are eight output port (numbered 1 through 8), and this controls the state (high or low) of each one. [*] means no change in state -- that is, to leave high if high, or to leave low if low.
When you turn on the machine, all output ports are at the low state. When you execute this command to set a certain port high, the port is maintained in that state until you switch off the power. (The state does not revert to low even when sequence execution ends.) If initialization of the port is required, it is useful to insert a command such as [11 P 00000000] at the start or end of the sequence.
For information about the specifications of expansion connector 2, see p.143 "Expansion Connector 2."

12 WAIT

Function This stops sequence execution for the specified interval of time.
Value ∂ Wait time (0 to 10,000 ms)

```
 1:
12  WAIT   10000∂
```

This pauses sequence execution, waits for the specified time interval, then resumes execution. A setting of [3000], for example, specifies a wait time of 3 seconds.

13 WAIT KEY

Function This pauses sequence execution and waits until any button is pressed.
Value None

This pauses sequence execution and goes into standby, displaying the following screen. Pressing any button on the operation panel resumes execution.

```
PUSH ANY KEY
<13 WAIT KEY>
```

14 W

Function This pauses sequence execution and waits until input ports on expansion connector 2 go to the specified state.
Value ∂ Input-port state (1: High, 0: Low, *: Either)

```
  1:
14 W 0000000∂
```

00000000
Input port 1 Input port 8

This goes into standby while monitoring the state of the input ports on expansion connector 2, and resumes execution when the specified state occurs. Standby continues until all eight input ports go to the specified state (high or low). [*] indicates that the state may be either high or low.
For information about the specifications of expansion connector 2, see p.143 "Expansion Connector 2."

15 BREAK

Function This pauses sequence execution and waits until any button is pressed.
Value None

This pauses sequence execution, displaying the following screen while in standby. Pressing any button on the operation panel resumes execution.

```
PUSH ANY KEY
<15 BREAK>
```

This command is available only when [BREAK POINT] at the [SETTING] submenu is set to [ENABLE]. When this is set to [DISABLE], the machine does not go into standby or display this screen. This point is different from the [WAIT KEY] command.

16 JUMP

Function This jumps to the specified label.
Value ∂ Label name

```
  1:
16 JUMP Label name∂
```

This vary changes the order of step execution. Execution does not proceed to the next step, but instead jumps to the step to which the specified label name has been assigned.

17 J

Function This jumps to the specified label when an input port on expansion connector 2 is at th specified state.
Value ∂ Label name
Value ∑ Input port number (1 through 8)
Value ∏ Input-port state (1: High, 0: Low)

```
  1:
17 J Label name ∂ Σ 10 Π
```

This checks the state of an input port on expansion connector 2, then either executes a jump if the input port is at the specified state or proceeds to the following step if not at the specified state. This checks one of the eight input ports and determines whether it is at the specified state (high or low).
For information about the specifications of expansion connector 2, see p.143 "Expansion Connector 2."

18 CALL

Function This jumps to the specified label, then returns to the original step.
Value ∂ Label name

```
  1:
18 CALL Label name ∂
```

This jumps to the step to which the specified label name has been assigned. When a [RETURN] command is encountered thereafter, execution returns to the step where the jump occurred and resumes with the following step. This is uses to call a subroutine. You cannot call a second subroutine from within a first one (that is, nested subroutines are not permitted).

19 C

Function This calls the specified label when an input port on expansion connector 2 is at the specified state.
Value ∂ Label name
Value ∑ Input port number (1 through 8)
Value ∏ Input-port state (1: High, 0: Low)

```
  1:
19 C Label name ∂ Σ 10 Π
```

This checks the state of an input port on expansion connector 2, then either executes a call if the input port is at the specified state or proceeds to the following step if not at the specified state. This checks one of the eight input ports and determines whether it is at the specified state (high or low).
For information about the specifications of expansion connector 2, see p.143 "Expansion Connector 2."

20 RETURN

Function This signals the end of a subroutine called using a [CALL] or [C] command.
Value None

This is used in conjunction with the [CALL] or [C] command. When a [RETURN] command is executed after a jump made using these commands, execution returns to the step where the jump occurred. Nothing happens if this command is executed before a jump has been performed.

21 SEL ORG

Function This selects an optional origin.
Value ∂ ptional origin (No. 1 through 100)

This changes the origin point for spindle positioning from the workpiece origin point to an optional origin. You can use [OPTIONAL ORIGIN] at the [SETTING] submenu to store up to 99 optional origin locations (No. 2 through No. 100) in memory. Selecting [No.1] restores the original workpiece origin point.

22 FINISH

Function This ends execution of a sequence.
Value None

A sequence must have this as its final command. It is normally sufficient for a sequence to have only one, at the end of the sequence, but it poses no problem if a number of them appear throughout the sequence. If this command appears in the middle of a sequence, execution ends when it is encountered.

23 DO NOTHING

Function This performs no operation.
Value None

This is used for inserting a dummy step and for similar purposes.

24 DELETE THIS STEP

This is not a command, and is not stored in memory. When you want to delete a single step, select this and press the [ENTER/PAUSE] button. The displayed step is deleted.

25 INSERT NEW STEP

This is not a command, and is not stored in memory. When you want to insert a new step, select this and press the [ENTER/PAUSE] button. The inserted step is a [DO NOTHING] operation.

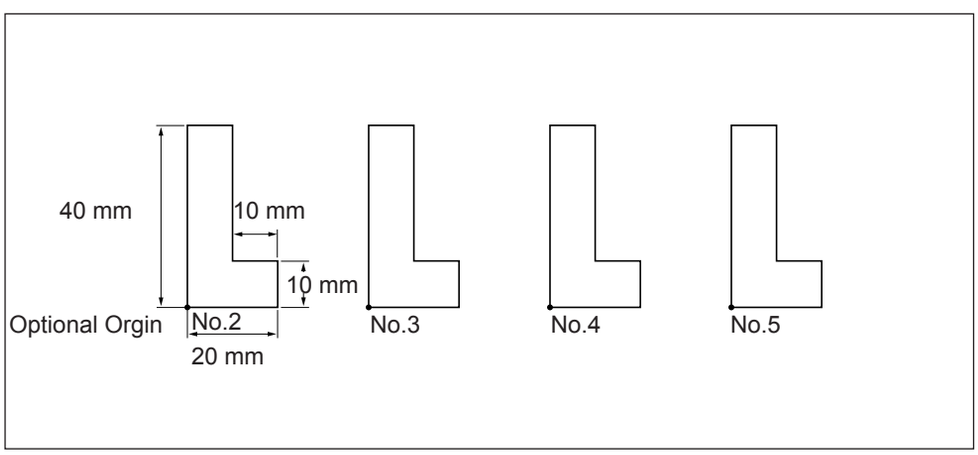
5-8 Sample Sequences

This is an example of sequence creation. Refer to it when creating your own sequences.

Example of a Sequence Using Optional Origins

This cuts the same shape several times. In cases like this, you can create extremely efficient sequences by using a combination of optional origins and [CALL] commands.
In this example, the No. 2 through No. 5 optional origins are assumed to be already registered. Also, the Z0 position is assumed to be at the surface of the workpiece.

Z0 position : Workpiece surface
Cutting-in depth : 0.5 mm
X- and Y-axis feed rate : 20 mm/s
Z-axis feed rate : 3 mm/s
Spindle speed : 25,000 rpm



Steps 1 through 16 are the main routine, and steps 17 through 27 are a subroutine called by the [CALL] command. This subroutine cuts a single L-shaped object. Steps 4, 6, 8, and 10 successively change the reference point for cutting, and after each step the subroutine is called.
Note that the [FINISH] command in step 16 separates the main routine and the subroutine. More than one [FINISH] command may safely appear within a sequence.

Step No.	Label name	Command	Value 1	Value 2	Value 3	Value 4
1		21 SEL ORG	1			
2		2 MOVE-ORG				
3		10 SP	ON	80		
4		21 SEL ORG	2			
5		18 CALL	LCUT			
6		21 SEL ORG	3			
7		18 CALL	LCUT			
8		21 SEL ORG	4			
9		18 CALL	LCUT			
10		21 SEL ORG	5			
11		18 CALL	LCUT			
12		21 SEL ORG	1			
13		2 MOVE ORG				
14		3 MOVE-ZM	X 0, Y 30000, Z 4000			
15		10 SP	OFF			
16		22 FINISH				
17	LCUT	2 MOVE ORG				
18		3 MOVE-ZM	X 0, Y 0, Z 100			
19		8 CUT-3	3	X 0, Y 0, Z -50		
20		8 CUT-3	20	X 2000, Y 0, Z -50		
21		8 CUT-3	20	X 2000, Y 1000, Z -50		
22		8 CUT-3	20	X 1000, Y 1000, Z -50		
23		8 CUT-3	20	X 1000, Y 4000, Z -50		
24		8 CUT-3	20	X 0, Y 4000, Z -50		
25		8 CUT-3	20	X 0, Y 0, Z -50		
26		2 MOVE ORG				
27		20 RETURN				
28		22 FINISH				

Chapter 6
Detailed Description of Functions

This chapter provides detailed descriptions of the machine's coordinate systems and origin points, and also describes all the functions you can access using the menus. Use it as a reference and read it as required.

6-1 Coordinate Systems and Origin Points

Workpiece Coordinates and Machine Coordinates

This machine uses coordinate values for the X, Y, and Z axes to indicate the position and height of the spindle head. The display's top screen displays coordinate values that indicate the position of the spindle head. The coordinates displayed here are a type of relative coordinates that take the "workpiece origin point" as the reference point.
You can freely change the location of the workpiece origin point. If the location of the origin point is altered, the displayed coordinate values also change, even if the actual position of the spindle head remains the same. Such coordinates are called "workpiece coordinates."

The position at the machine's mechanical operating limits, that is, all the way to the left along the X axis, all the way to the front along the Y axis, and all the way to the top along the Z axis, is called the "machine origin point." Coordinates that take this as the reference point are called "machine coordinates."
The location of the machine origin point is determined mechanically and cannot be changed. Machine coordinates indicate the absolute position of the spindle head. The location of a workpiece origin point that can be freely changed can only be indicated by machine coordinates. For this reason, the X/Y-axis origin-point setting menu and the Z-axis origin-point setting menu display only machine coordinates.

The Machine's Workpiece Origin Point

With this machine, a reference to just "the origin point" or "the origin" signifies the workpiece origin point. You can also divide the location of the workpiece origin point into two parts, an X- and Y-coordinate origin and a Z-coordinate origin, and set these separately. With this machine, the X- and Y-coordinate workpiece origin point is called the "home position," and the Z-coordinate workpiece origin point is called the "Z0 position."
The home position serves as a reference point that determines where on the table cutting is performed. Also, the tool-down and tool-up positions are determined with reference to the Z0 position. These may be considered as indicating the number of millimeters to lower or rise from the Z0 position.
Changing the home position or the Z0 position also makes the location of cutting or the cutting-in depth change, even when the commands from the computer are exactly the same.

Unit of Measurement for Coordinate Values

One coordinate unit is 0.01 mm (0.00039 in.). An increase of 100 in a coordinate value produces 1 mm of movement.

6-2 Detailed Description of the Nose Unit

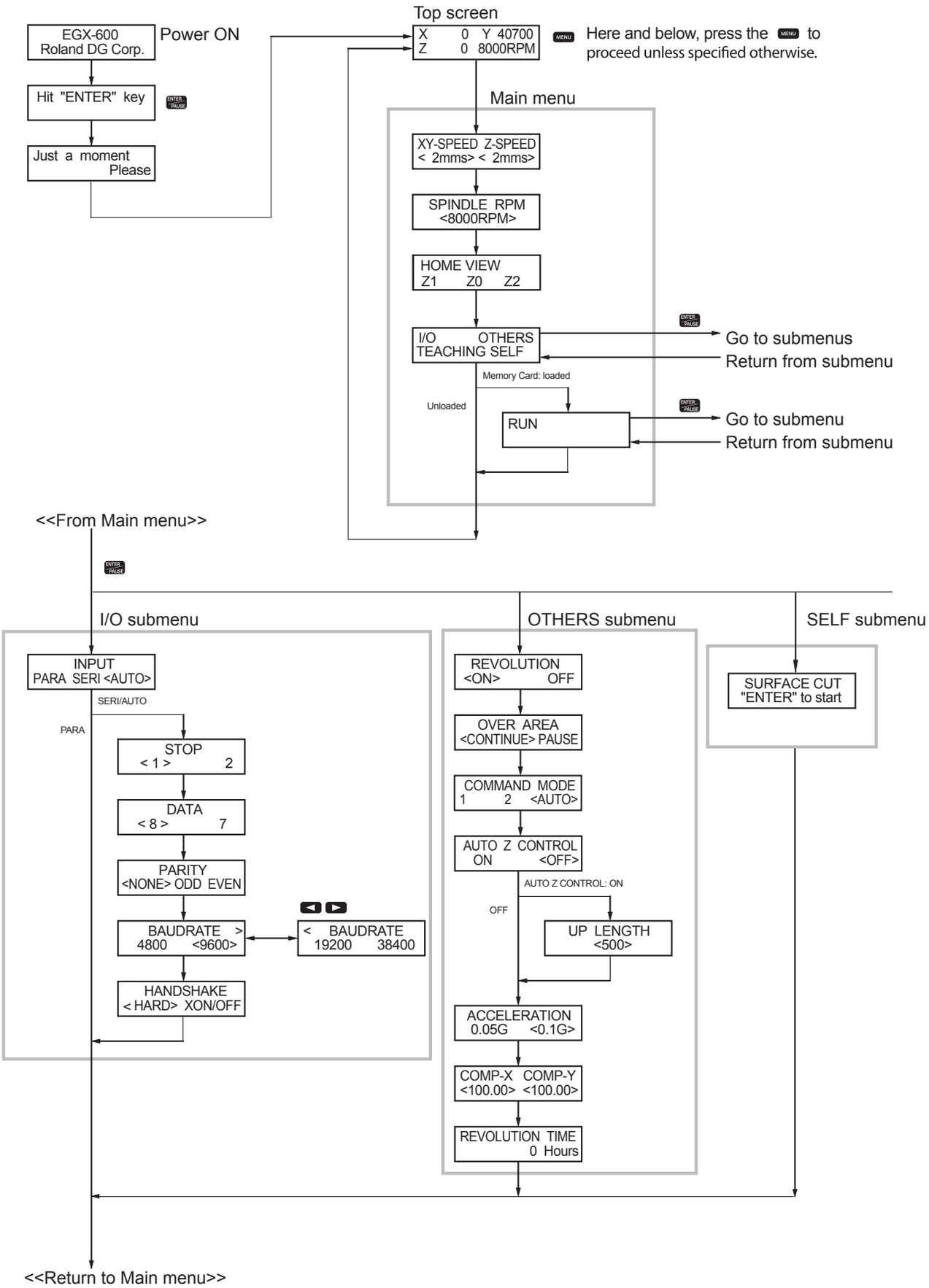
Amount of Height Displacement That Can Be Tracked

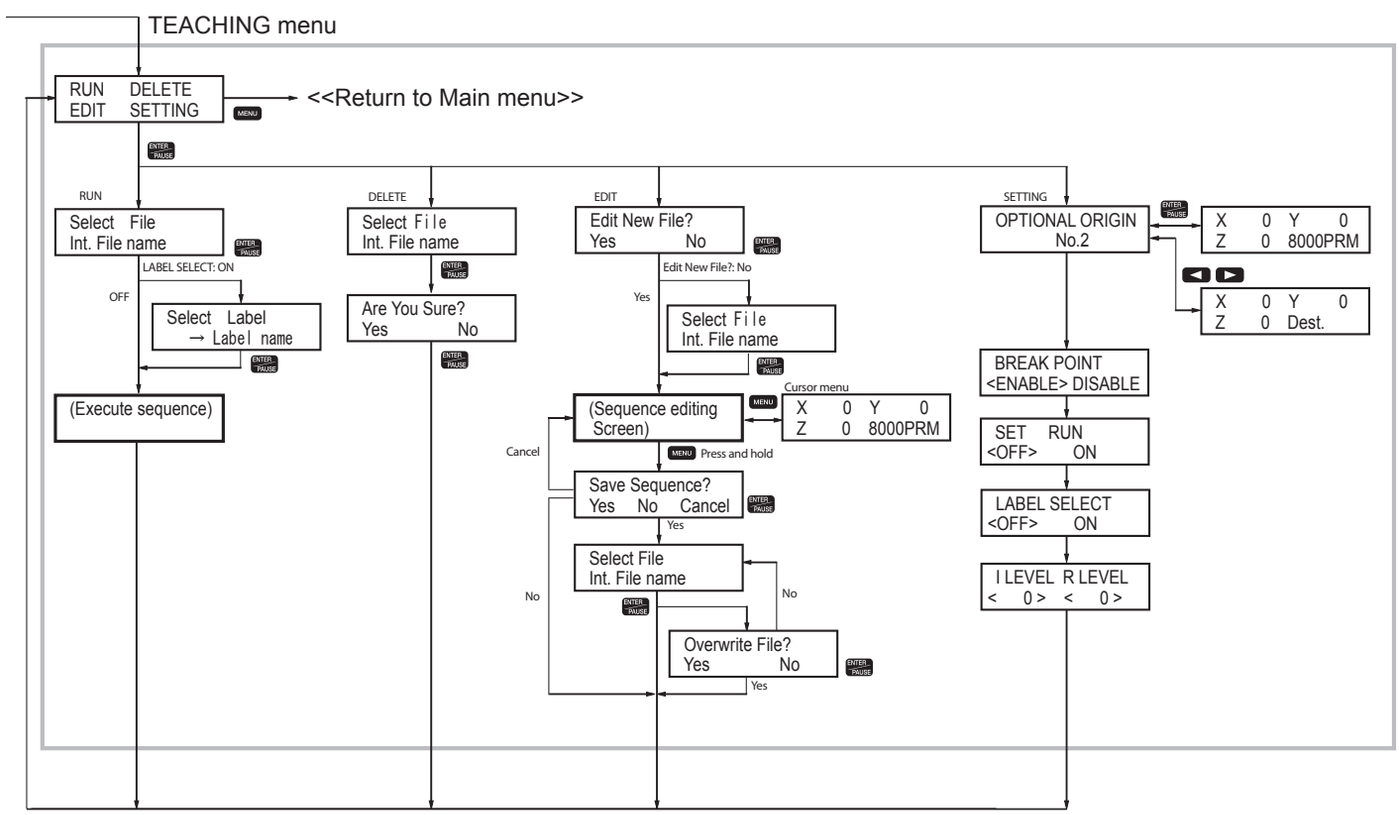
As long as the tip of the depth regulator nose unit (nose unit) is in contact with the surface of the workpiece, the cutting-in depth can be kept uniform even if the height of the material changes. Slight surface curvature of a workpiece and variations in plate thickness are tracked.
However, there is an upper limit to the amount of height displacement that can be tracked.

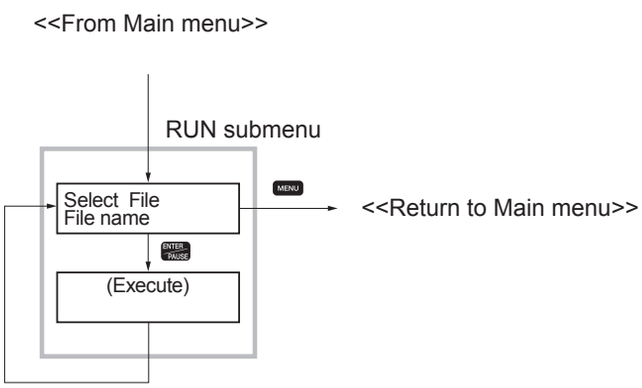
Limitations on Cutting

Care is needed when performing fill engraving (flat-drag cutting inside the contour lines of characters and shapes) over a wide surface area. With fill engraving that is broader than the diameter of the nose cone, the nose unit may track the surface that has already been cut and cut the surface further.

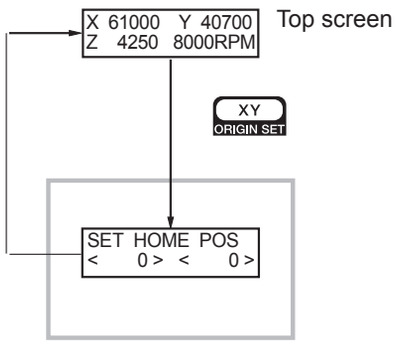
6-3 Menu Flowchart



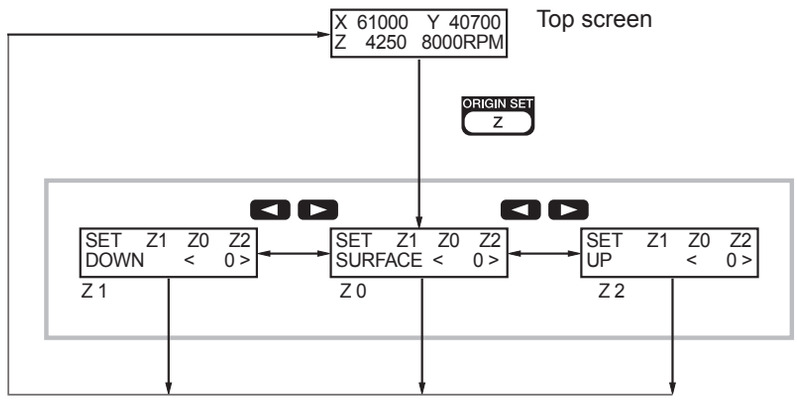

TEACHING menu
RUN DELETE
EDIT SETTING
MENU
<<Return to Main menu>>
ENTER PAUSE
RUN
Select File
Int. File name
LABEL SELECT: ON
OFF
Select Label
→ Label name
(Execute sequence)
DELETE
Select File
Int. File name
Are You Sure?
Yes No
EDIT
Edit New File?
Yes No
Edit New File?: No
Yes
Select File
Int. File name
Cursor menu
(Sequence editing
Screen)
X 0 Y 0
Z 0 8000PRM
Cancel
Press and hold
Save Sequence?
Yes No Cancel
Yes
Select File
Int. File name
No
No
Overwrite File?
Yes No
Yes
SETTING
OPTIONAL ORIGIN
No.2
X 0 Y 0
Z 0 8000PRM
X 0 Y 0
Z 0 Dest.
BREAK POINT
<ENABLE> DISABLE
SET RUN
<OFF> ON
LABEL SELECT
<OFF> ON
I LEVEL R LEVEL
< 0 > < 0 >


<<From Main menu>>
RUN submenu
Select File
File name
MENU
<<Return to Main menu>>
ENTER
PAUSE
(Execute)

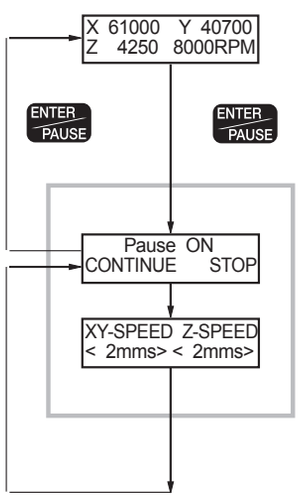
X/Y-axis Origin-point Setting Menu



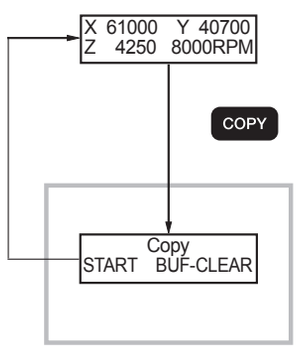
Z-axis Origin-point Setting Menu



Pause Menu

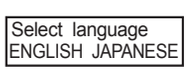


Copy Menu



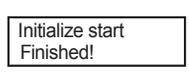
Language Menu

Hold down MENU and switch on the power.



Initialize Menu

Hold down ENTER PAUSE and switch on the power, and continue holding down the button for at least one second.



6-4 Detailed Description of the Menus

This is a list of the functions you can access using the machine's menus.

Saved This shows whether the setting value is saved in memory and persists even after the power is switched off.
Setting This shows the available range, selections, and unit of measurement for the setting.
Default This shows the value of the setting in effect when the machine was shipped from the factory.

Main Menu

XY-SPEED Z-SPEED

Saved Yes
Setting XY-SPEED: 0.5, 1 to 100 mm/s Z-SPEED: 0.5, 1 to 50 mm/s
Default XY-SPEED: 2 mm/s Z-SPEED: 2 mm/s

These set the feed rate for the X and Y axes and for the Z axis. When a command to change the feed rate is received from the computer, the value changes accordingly. When the feed rate is 0.5 mm/s, the displayed value is [0].
In the case of simultaneous feed of all three axes (operation according to an RML-1 command-set Z or !ZZ command), the value of the [Z-SPEED] setting is used for the feed rate.

SPINDLE RPM

Saved Yes
Setting 8,000 to 30,000 rpm
Default 8,000 rpm

This sets the default spindle rotating speed. You can change the spindle speed at any time using the dial or by sending a command from the computer, but the value returns to this setting when the power is turned off.

HOME VIEW Z1 Z0 Z2

These moves the spindle head to fixed positions.
[HOME] raises the spindle to the upper limit and moves it to the home position at the highest speed. [VIEW] raises the spindle to the upper limit and moves it to the VIEW position at the highest speed.
[Z1] rotates the spindle, then lowers it to the Z1 position at the feed rate set using [Z-SPEED]. This operation is executed when you hold down the [ENTER/PAUSE] button for a short while (0.5 seconds or longer). [Z0] lowers the spindle to the Z0 position at the feed rate set using [Z-SPEED]. [Z2] raises the spindle to the Z2 position at the highest speed.

I/O OTHERS TEACHING SELF

These call up the corresponding submenus.

RUN

This calls up the [RUN] submenu. This menu appears only when a memory card is loaded in the machine.

[I/O] Submenu

INPUT

Saved Yes
Setting PARA, SERI, AUTO
Default AUTO

This selects the connector for connection to a computer. Commands from the computer are received via the connector you specify here. When this is set to [AUTO], the connector through which commands are first received after powerup is enabled automatically.
When this is set to [SERI] or [AUTO], the menu for setting the serial communication parameters appears.

STOP

Saved Yes
Setting 1, 2
Default 1

This makes the setting for the number of stop bits, one of the serial communication parameters. This is displayed only when [INPUT] is set to [SERI] or [AUTO].

DATA

Saved Yes
Setting 7, 8
Default 8

This makes the setting for the data bit length, one of the serial communication parameters. This is displayed only when [INPUT] is set to [SERI] or [AUTO].

PARITY

Saved Yes
Setting NONE, ODD, EVEN
Default NONE

This makes the setting for parity, one of the serial communication parameters. This is displayed only when [INPUT] is set to [SERI] or [AUTO].

BAUDRATE

Saved Yes
Setting 4800, 9600, 19200, 38400
Default 9600

This makes the setting for the baud rate, one of the serial communication parameters. This is displayed only when [INPUT] is set to [SERI] or [AUTO].

HANDSHAKE

Saved Yes
Setting HARD, XON/OFF
Default HARD

This makes the setting for handshaking (flow control), one of the serial communication parameters. [HARD] indicates hardware handshaking, and [XON/OFF] indicates XON/XOFF handshaking. This is displayed only when [INPUT] is set to [SERI] or [AUTO].

[OTHERS] Submenu

REVOLUTION

Saved Yes
Setting ON, OFF
Default ON

When set to [OFF], the spindle does not rotate at all. The spindle does not rotate even when commands are received from the computer, but movement of the spindle head is performed.

OVER AREA

Saved Yes
Setting CONTINUE, PAUSE
Default CONTINUE

This makes the setting for operation on receiving a command for movement outside the range of operation for the X and Y axes. The spindle head stops moving when the X or Y axis goes outside the range of operation. Movement starts again when a command to return from that location to the range of operation is received. When this is set to [CONTINUE], operation resumes at this time without change. When this is set to [PAUSE], operation is paused and you can select whether to resume operation or quit cutting.

COMMAND MODE

Saved Yes
Setting 1, 2, AUTO
Default AUTO

This selects the type of commands received from the computer. [1] selects RML-1 mode 1 and [2] selects RML-1 mode 2. When this is set to [AUTO], the command first received after the power is switched on is recognized, and the setting for mode 1 or mode 2 is made automatically.

AUTO Z CONTROL

Saved Yes
Setting ON, OFF
Default OFF

Set this to [ON] in cases such as when you are using the nose unit. When this is set to [ON], then whenever the tool is lowered the height of the workpiece surface is detected and the Z0 position is set automatically.
Note that this feature is available only in the cases described below. The function is disabled at other times, and operation is the same as when [AUTO Z CONTROL] is set to [OFF].

- When performing cutting using a computer (not available when performing cutting using the teaching feature).
- When moving the spindle head using the Z-axis movement button.
- When moving the spindle head using the D, M, I, R, PA, PD, PR, or PU command in the RML-1 command set (not available when using the Z, !ZM, or !ZZ command).

Also, when this function is set to [ON], the Z-axis origin-point setting menu is not displayed and !PZ and !Z0 commands are ignored.
When you tighten the lock nut to lock the spindle head, be sure to set this to [OFF].

UP LENGTH

Saved Yes
Setting 0 to 2,000 (one step = 0.01 mm)
Default 500 (5 mm)

This is displayed when [AUTO Z CONTROL] is set to [ON]. This sets the amount of cut-out when [AUTO Z CONTROL] is set to [ON]. Note that due to the characteristics of the machine, the actual amount of cut-out may not necessarily be the same as the value of the setting. 6-4. Detailed Description of the Menus

ACCELERATION

Saved Yes
Setting 0.05 G, 0.1 G
Default 0.1 G

This makes the setting for the quality of text engraving. When this is set to [0.05G], cutting times become longer, but the quality of text engraving is improved.

COMP-X COMP-Y

Saved Yes
Setting 99.90 to 100.10%
Default 100.00

This corrects for movement distance along the X and Y axes.

REVOLUTION TIME

This displays the working time of the spindle motor. Use it as a guide for determining the service life of the spindle unit.

[SELF] Submenu

SURFACE CUT

This performs surfacing to adjust the flatness and parallelism of the table surface. Before you execute this, make the following settings.

- Setting for the Home Position: Set the home position at the front-left corner of the table (the limit position for the X and Y axes).
- Setting for the Z0 Position: Set the Z0 position at the surface of the table.

It is assumed that you are performing this operation using a ZEC-A4430 cutter from Roland DG Corp. The cutting-in depth is 0.2 mm (0.0008 in.), the amount of cut-out is 1 mm, the feed rate is 30 mm/s, and the spindle speed is 20,000 rpm.

Teaching Menu

RUN

The next submenus are available.

[Select File]

This calls up and executes a saved sequence. [Int.] indicates a file saved in the machine's built-in memory, and [Ext.] indicates a file saved on a memory card.

[Select Label]

When there is a label specified in the sequence and [LABEL SELECT] is set to [ON], the [Select Label] screen appears. When this happens, execution starts at the label location selected there.

DELETE

This selects and deletes a single saved sequence.

EDIT

This displays the menu for creating a sequence. There are screens for calling up and saving files, the sequence editing screen for entering commands, and other screens.

[Edit New File?]

To create a new sequence, select [Yes]. To edit an existing sequence, select [No].

[Select File]

You use this to specify a file name when saving a sequence, or to call up an existing sequence you want to edit. Also, [Int.] indicates the machine's built-in memory, and [Ext.] indicates a memory card.

Sequence Editing Screen

For more information, refer to "The Teaching Feature" on p.73.

Cursor Menu

To display this, press the [MENU] button while at the sequence editing screen's basic screen. You can use the movement buttons and the [SPINDLE] button to move and rotate the spindle in the same way as when you are at the top screen. To go back to the original screen, press the [MENU] button again.

SETTING

This calls up the submenu for setting the preferences for the teaching feature. 6-4. Detailed Description of the Menus

[SETTING] Submenu

OPTIONAL ORIGIN

Saved Yes
Setting X, Y, and Z coordinates settable on the machine
Default None

This registers a special workpiece origin point referenced by a sequence. You can register up to 99 (No. 2 through 100). You specify all three of the X, Y, and Z axes, without division into one origin for the X and Y axes and one for the Z axis. An optional origin point differs from the workpiece origin points (the home position and the Z0 position) set with the machine, and is exclusively for the teaching function.
You can use the [SEL ORG] command to temporarily make a optional origin point the reference point for cutting. You can freely set and select specify 99 reference points for cutting. When you want to carry out identical cutting successively at different locations, using this command makes it possible for you to reduce the number of steps and change the cutting location without having to edit the sequence.
Be careful to note that the locations of the optional origins are determined with reference to the home position and Z0 position set on the machine. If you change the home position or the Z0 position, the locations of all 99 optional origins also change.

BREAK POINT

Saved Yes
Setting ENABLE, DISABLE
Default ENABLE

This sets whether the [BREAK] command is enabled or disabled. When this is set to [DISABLE], the machine does not go into standby state when a [BREAK] command appears in a sequence.

STEP RUN

Saved Yes
Setting OFF, ON
Default OFF

When this is set to [ON], the machine goes into standby after executing each step, then proceeds to the next step when you press any button. This is handy when you want to verify the operation of a sequence.

LABEL SELECT

Saved Yes
Setting OFF, ON
Default OFF

This sets whether you can select a label location for starting execution when executing a sequence. When this is set to [OFF], no [LABEL SELECT] screen appears at the RUN menu.

I LEVEL R LEVEL

Saved Yes
Setting -4,250 to 4,250 (1 step = 0.01 mm)
Default 0

These set special values for specifying the spindle height in a sequence. You specify the spindle height as the number of millimeters above (positive value) or below (negative value) the Z0 position. These values are used by the [MOVE-ZI], [CUT-ZI], and [CUT-ZM] commands.
Selecting an optional origin in a sequence using the [SEL ORG] command makes the I level and R level change to locations that reference the selected optional origin. 6-4. Detailed Description of the Menus

[RUN] Submenu

RUN

This imports and executes a file saved on a memory card (a text file containing RML-1 commands). Operation is much like that when the machine receives commands from a computer. The origin-point setting menus, pause menu, and copy menu are also available. Displayed error messages are also similar.
However, device control commands are ignored. Also, commands from the parallel or serial connector are not accepted during execution.
This menu appears only when a memory card is loaded in the machine. It also contains the following submenus.

[Select File]

This displays the file names of data saved on the memory card and lets you select the one you want to execute. Note that files saved in subdirectories and files with file names that are longer than eight characters or that have file extensions longer than three characters are not displayed. 6-4. Detailed Description of the Menus

X/Y-axis Origin-point Setting Menu

SET HOME POS

Saved Yes
Setting 0 to X- and Y-axis operating limit (machine coordinates)
Default X: 0, Y: 0

This sets the present spindle location as the home position (the X- and Y-axis workpiece origin point). The displayed values are the machine coordinates for the present location of the spindle. When you are at this menu, you use the movement buttons to move the spindle.

Z-axis Origin-point Setting Menu

SET Z1 Z0 Z2

Saved Yes
Setting Z1: -4,250 to 0 (1 step = 0.01 mm), Z0: -4,250 to 0 (machine coordinates), Z2: 0 to 4,250 (1 step = 0.01 mm)
Default Z1: 0, Z0: 0, Z2: 4,250

[Z0] sets the Z0 position (the Z-axis workpiece origin point) at the present spindle height. The displayed value is the machine coordinate for the present spindle height.
[Z1] sets the cutting-in depth. The displayed value is the distance between the present spindle height and the Z0 position. The Z1 position must be lower than the Z0 position, and the setting must be a negative value. If the present spindle height is above the Z0 position, [------] is displayed, indicating that you cannot set Z1 at this position.
[Z2] sets the amount of cut-out. The displayed value is the distance between the present spindle height and the Z0 position. The Z2 position must be above the Z0 position, and the setting must be a positive value. If the present spindle height is below the Z0 position, [------] is displayed, indicating that you cannot set Z2 at this position.
When a command to set the cutting-in depth or the amount of cut-out is sent from the computer, the value of [Z1] or [Z2] changes accordingly.
When you are at this menu, you use the Z-axis movement buttons to move the spindle. This menu does not appear when "AUTO Z CONTROL" is set to "ON."

Pause Menu

Pause ON

[CONTINUE, STOP]

Pressing the [ENTER/PAUSE] button while a cutting operation is in progress stops the operation and puts the machine in a paused standby state. The spindle keeps rotating, but you can stop rotation using the [SPINDLE] button. Executing [CONTINUE] makes cutting start again. Executing [STOP] quits cutting.

XY-SPEED Z-SPEED

You can change the feed rate while operation is paused. You make the setting in the same way as with the main menu. After you make the setting, use the [MENU] button to return to the previous screen, then execute [CONTINUE] to start cutting at the new feed rate. 6-4. Detailed Description of the Menus

Copy Menu

Copy

[START, BUF-CLEAR]

This feature repeats the same cutting. Executing [START] repeats exactly the same operation as the very last cutting operation.

Commands sent from the computer are temporarily stored in the machine. (The place where they are stored is called a buffer memory.) This features retrieves the commands in the buffer and executes them again. Note that the execution of sequences by the teaching feature cannot be repeated.

The buffer stores one set of data sent from the computer. When you send one set of data from the computer, then later send a second set, the first set of data is deleted and only the second set remains. When you are performing cutting while the machine is receiving data from the computer, using the pause menu to quit cutting causes the data in the process of being received to be deleted without being stored. Also, you cannot repeat operations using data whose size exceeds the capacity of the buffer. Stored data is lost when you switch off the machine.

Executing [BUF-CLEAR] deletes stored data.

Language Menu

Select language

Saved Yes
Setting ENGLISH, JAPANESE
Default ENGLISH

This selects the language used for the display. To display this menu, hold down the [MENU] button and turn on the power.

Initialize Menu

Initialize

This initializes all settings made using the menus, returning them to their factory-default values. To perform initialization, hold down the [ENTER/PAUSE] button as you switch on the power. Continue holding down the [ENTER/PAUSE] button for at least one second.

Chapter 7 Maintenance

This chapter describes daily care and maintenance.

7-1 Daily Care

Carefully clean away cutting waste. In addition to the table and bed, also clean the spindle head and the X-axis rail.

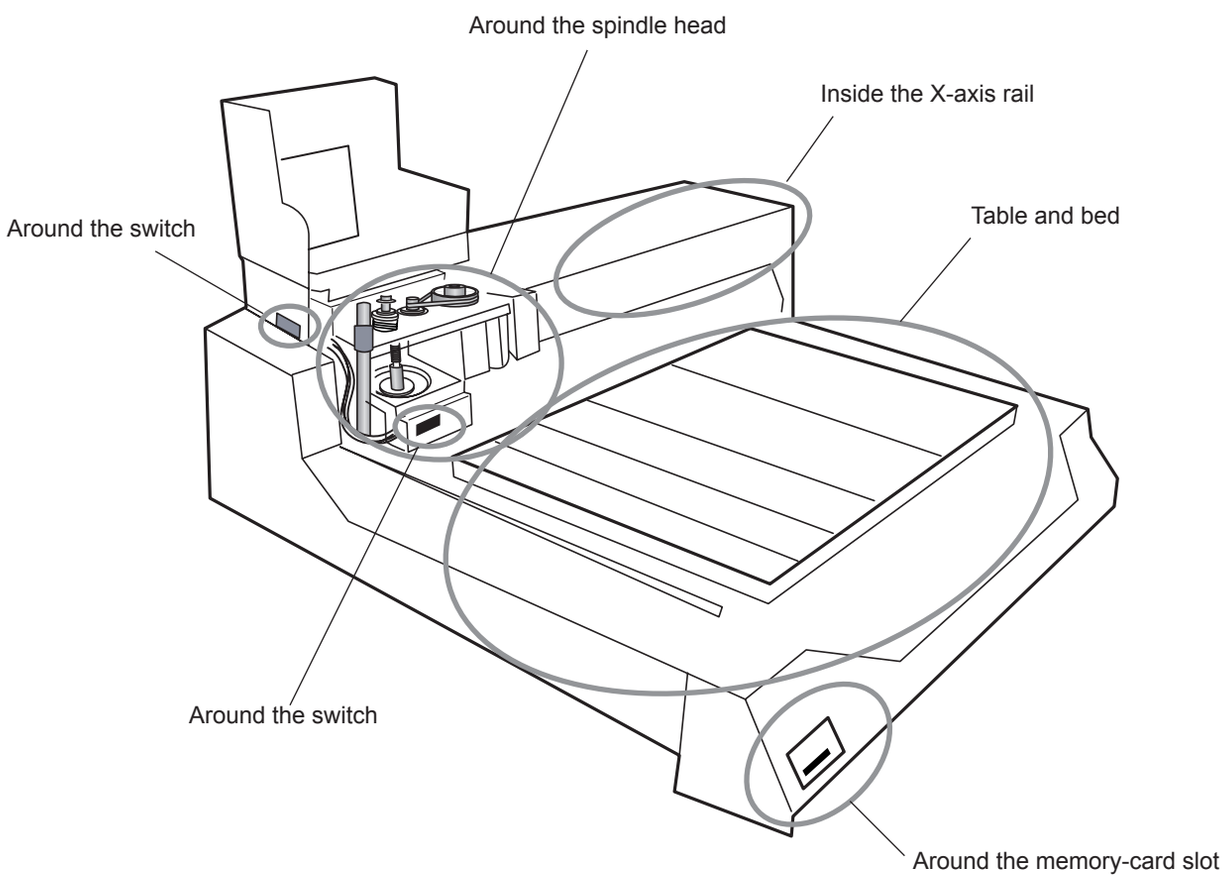
Use a commercially available brush to remove metal cuttings. Attempting to use a vacuum cleaner to take up metal cuttings may cause fire in the vacuum cleaner.

Do not use a pneumatic blower to clean. Cutting dust may be hazardous to health. Breakdown of the machine may also occur.

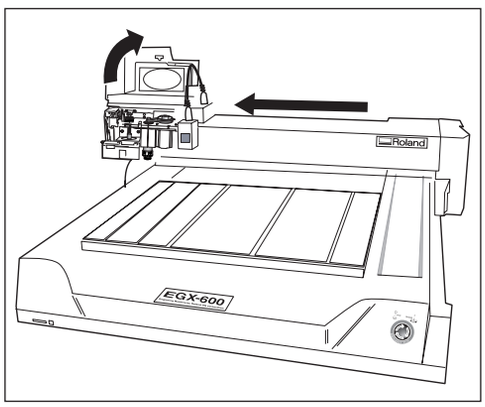
Switch off the machine and unplug the power cord from the electrical outlet before performing cleaning or maintenance. Failure to do so may result in injury or electrical shock.

Notice

Do not use solvents such as thinner, benzine, or alcohol to clean.

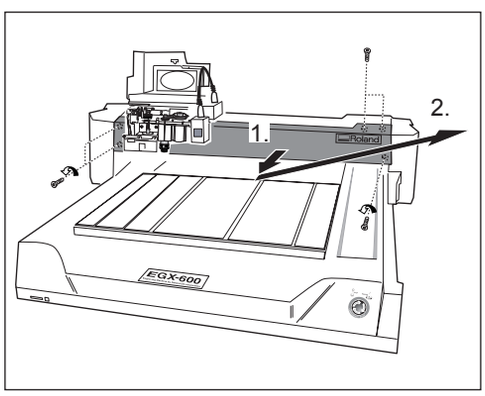


Cleaning Inside the X-axis Rail

❶ 

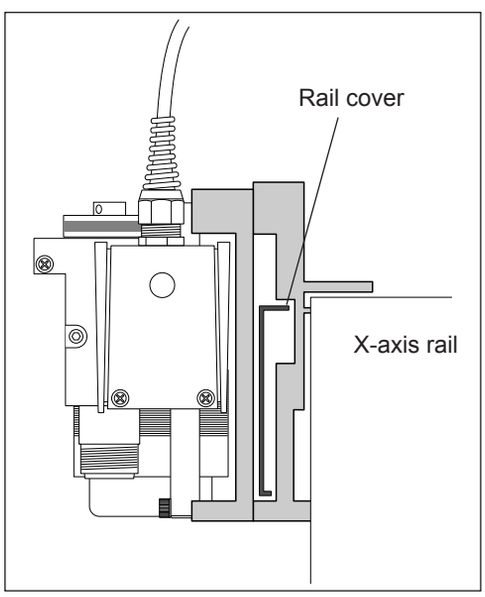
Move the spindle head all the way to the left side. Open the spindle cover.

❷ Switch off the machine.

❸ 

Remove the screws (at five locations) securing the rail cover, then gently pull out the rail cover to the right side to remove it.

❹ Use a brush or vacuum cleaner to clean inside the rail. Gently move the spindle head by hand and clean along the entire width of the rail.

❺ 

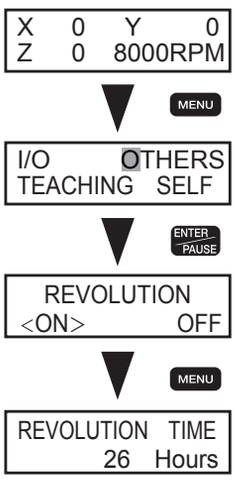
Follow the procedure described above in reverse to attach the rail cover and screws.

7-2 Maintenance and Inspection

Spindle Maintenance

The spindle unit and the belt are consumable components. As a general guide, it should be replaced after every 2,000 hours.
As a general guide, the spindle motor should be replaced after every 6,000 hours.
When performing replacement, read the documentation included with the replacement unit or contact your authorized Roland DG Corp. dealer or Roland DG Corp. service center.

This machine has a feature that lets you view the total working time of the spindle. Refer to this to determine when replacement is needed.



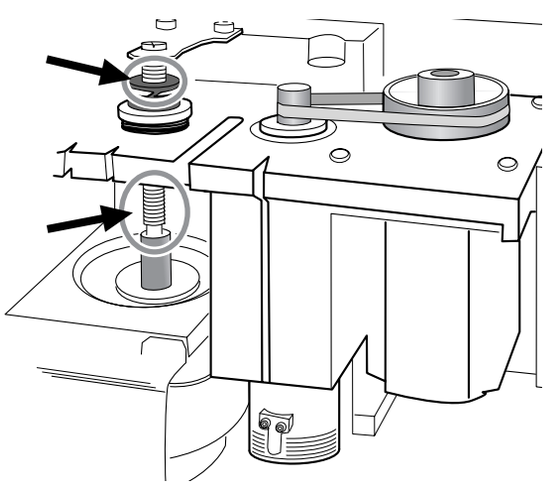
Maintenance of the Z-axis Screw

Switch off the machine and unplug the power cord from the electrical outlet before performing cleaning or maintenance. Failure to do so may result in injury or electrical shock.

Use a cleaning cloth or the like to clean away any buildup of cutting waste or old grease on the Z-axis screw, then apply a small amount of fresh grease.

Recommended grease: Lithium grease #2 or the equivalent

Notice
Do not lubricate any areas other than the Z-axis screw.



Chapter 8 Troubleshooting

This chapter describes possible problems and how to correct them.

8-1 Problems with Engraving

The cutting-in depth is not uniform (when using the nose unit).

- Go to the [OTHERS] submenu and make sure [AUTO Z CONTROL] is set to [ON], and also make sure that the lock nut has been loosened.
- The cutter holder, tool securing screw, or collet is loose. Tighten sufficiently while using the included wrench to keep the spindle immobile.
- The retainer nut securing the nose cone in place is loose. Tighten the retainer nut.
- The X- and Y-axis feed rate is too fast for the workpiece, or the spindle rotating speed is too slow. Try changing the cutting parameters.
- The cutter is worn. Try replacing the cutter.
- If the cutting-in depth is set to an extremely shallow value, the effects of cutting waste may be large. Try using a cutter with a narrow blade width, along with increasing the cutting-in depth. Alternatively, use an optional vacuum nose adapter for chip cleaning.

The cutting-in depth is not uniform (when not using the nose unit).

- If possible, perform engraving using a nose unit.
- Obtaining a uniform cutting-in depth over a broad area without using a nose unit requires a considerable amount of preparation. The first requirement is a workpiece that has a uniform thickness and is free from warping. The workpiece must also be loaded horizontally, and this demands considerable precision. Thereafter, if the flatness and levelness of the table are a concern, carry out surfacing.
- The lock nut is loose. Tighten the lock nut securely. Be sure to go to the [OTHERS] submenu and set [AUTO Z CONTROL] to [OFF].
- The cutter holder, tool securing screw, or collet is loose. Tighten sufficiently while using the included wrench to keep the spindle immobile.

The cutter leaves tracks at places where cutting-in starts or where lines change direction.

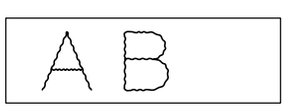
- The spindle rotating speed is too fast with respect to the feed rate. Try reducing the spindle speed.
- Go to the [OTHERS] submenu and try setting [ACCELERATION] to [0.05G].
- The cutter is worn. Try replacing the cutter.

An engraved bottom surface is rough or burring remains.

- The spindle rotating speed is too slow with respect to the feed rate. Try increasing the spindle speed or making the feed rate slower.
- Refasten the workpiece securely so that it does not come loose or slip.
- Try performing cutting a second time to finish the bottom surface and remove any burring. Making the cutting-in depth about 0.02 to 0.05 mm (0.001 to 0.002 in.) deeper for the second pass may yield better results.
- The cutter is worn. Try replacing the cutter.

Engraved lines are uneven or wavy.

- The cutter holder, tool securing screw, or collet is loose, and the cutter is out of control. Tighten securely.
- Refasten the workpiece securely so that it does not come loose or slip.
- Check to make sure the spindle unit is not loose.



When using a diamond scraper, cutting-in is shallow.

- Go to the [OTHERS] submenu and make sure [AUTO Z CONTROL] is set to [ON], and also make sure that the lock nut has been loosened.
- Try performing cutting a second time. Some materials that have an extremely hard surface (such as materials that have undergone surface treatment) may be suited to double cutting.
- The X- and Y-axis feed rate is too fast for the workpiece. Try using a slower feed rate.
- The cutter is worn. Try replacing the cutter.

The nose scratches the workpiece.

- Make sure the lock nut is loosened completely.
- The tip of the nose cone is rough or damaged. Try polishing using fine-grained sandpaper or an abrasive agent.
- The nose unit is unsuitable for engraving aluminum or brass.

8-2 Problems with Operation

The machine does not start.

The power cable is connected, but the power does not come on.

- Release the emergency stop switch. When the emergency stop switch is left pressed, the machine is powered up but nothing appears on the display and initialization is not performed.

Turning on the power switch makes an error message appear and the machine stops.

- See "Responding to an Error Message" on p.128.

No operation occurs when a button is pressed.

There is no response at all when the buttons are pressed.

- Release the emergency stop switch. When the emergency stop switch is left pressed, nothing appears on the display and no operation at all takes place.

The spindle head does not move when the movement buttons are pressed.

- Bring up the top screen on the display. The movement buttons cannot be used to move the spindle at any screen other than the top screen.

The spindle does not rotate when the spindle button is pressed.

- To rotate the spindle using the spindle button, hold down the button for a short while (0.5 seconds or longer).
- Go to the [OTHERS] submenu and set [REVOLUTION] to [ON].
- Close the spindle cover tightly. If it does not resolve the problem, then thoroughly clean away any cutting waste from around the spindle.

No movement takes place when the menus are used to move to the Z1 position.

- At the main menu, for [Z1] (movement to the Z1 position), press the [ENTER/PAUSE] button for a short while (0.5 seconds or longer).
- Close the spindle cover tightly. If it does not resolve the problem, then thoroughly clean away any cutting waste from around the spindle.

No operation occurs when cutting commands are sent from the computer.

No data comes from the computer.

- Release the emergency stop switch. When the emergency stop switch is left pressed, the machine is powered up but nothing appears on the display and no operation at all takes place.
- Go to the [I/O] submenu and make sure [INPUT] is set correctly. If you're using a printer cable to make the connection, set it to [AUTO] or [PARA]. If you're using a serial cable to make the connection, set it to [AUTO] or [SERI].
- Make sure the setting for the computer's output port is correct. You generally set this to "LPT1:" if connected using a printer cable, or to "COM1:" or "COM2:" if connected using a serial cable. Follow the instructions in the documentation for the program.
- Make sure the connector cable is the correct type. For a serial connection in particular, connection using a straight cable such as a modem cable will not work. Use a suitable cable for your computer, such as the XY-RS-34 from Roland DG Corp. (or the equivalent).
- Make sure the connector cable is free from faulty contact or broken wires. If you're using a printer switch or the like, try disconnecting it.
- If an error message appears on the display, also take a look at "Responding to an Error Message" on p.128.

Data is sent but there is no operation.

- Close the spindle cover tightly. When the cover is open, there is no operation at all except for control using the movement buttons, and an error message is displayed. If closing the cover securely does not resolve the problem, then thoroughly clean away any cutting waste from around the spindle.
- Make sure the machine is not paused. If the display shows the message [Pause ON], it means the machine is paused. Press the [ENTER/PAUSE] button to release the machine from the paused state.
- Make sure the connector cable is the correct type. For a serial connection in particular, connection using a straight cable such as a modem cable will not work. Use a suitable cable for your computer, such as the XY-RS-34 from Roland DG Corp. (or the equivalent).
- Make sure the connector cable is free from faulty contact or broken wires. If you're using a printer switch or the like, try disconnecting it.
- If an error message appears on the display, also take a look at "Responding to an Error Message" on p.128.

Abnormal cutting is performed.

The machine tries to perform cutting-in at an abnormal depth, and eventually a motor error occurs.

- Go to the [OTHERS] submenu and set [AUTO Z CONTROL] to [OFF]. This setting should be set to [ON] only when the lock nut has been loosened in order to use a nose unit and diamond scraper. In all other cases, be sure to set it to [OFF].
- If [AUTO Z CONTROL] is set to [OFF], then set the Z0 position (the Z-axis origin point) at a suitable position.

The machine tries to cut with no rotation of the spindle.

- Go to the [OTHERS] submenu and set [REVOLUTION] to [ON].
- Depending on the program, it may be possible to make a setting that keeps the spindle from rotating. Try checking the program's settings.

Unusual operation or erratic symptoms occasionally occur.

- Make sure the connector cable is free from faulty contact or broken wires. If you're using a printer switch or the like, try disconnecting it.
- If an error message appears on the display, also take a look at "Responding to an Error Message" on p.128.

Pressing the Z-axis Origin Set button does not display the menu.

- Go to the [OTHERS] submenu and set [AUTO Z CONTROL] to [OFF]. When this is set to [ON], the Z0, Z1 or Z2 cannot be set. This is done to prevent danger and help ensure safety.

The cutting position is different from the intended location.

- Make the setting for the home position. The cutting position changes according to the home position. For more information, see "Setting the Reference Point for the Cutting Position" on p.58.

The sound of the rotating spindle is unusually loud.

- The cutter holder, tool securing screw, or collet is loose, and the cutter is out of control. Tighten securely.
- The solid collet for diamond scrapers can also be used with a character cutter or flat cutter, but do not use it at a speed of 15,000 rpm or higher. There is danger of damage to the spindle due to vibration.

An error message is displayed.

- See "Responding to an Error Message" on p.128.

8-3 Responding to an Error Message

This describes the error messages that may appear on the machine's display, and how to take action to remedy the problem. If an error message not listed here appears, contact your authorized Roland DG Corp. dealer or Roland DG Corp. service center.

1. Command Not Recognized

A command that cannot be interpreted was received from the computer.

- This occurs when the program's setting does not match the machine's command set. Check the program's settings for the model and the like.
- This may also be displayed when a problem such as faulty contact by the connector cable impedes communication. Check the connector cable.
- To recover from an error, press the [ENTER/PAUSE] button to display the pause menu, then choose either [CONTINUE] or [STOP]. There may be cases where you can resume operation by selecting [CONTINUE], but because there is a possibility of faulty operation, you should reset the power.

A command that cannot be interpreted occurred in a sequence.

- This occurs when an incorrect command is encountered during sequence execution by the teaching feature. A major cause of this is corruption of the sequence due to a problem with the memory card or the like. Re-create the sequence.
- Press the [ENTER/PAUSE] button to pause the machine and clear the error.

2. Wrong Number of Parameters

The number of parameters for a command sent from the computer was different from the number that can be specified.

- This occurs when a program setting is not matched to the machine. Check the program's settings for the model and the like.
- This may also be displayed when a problem such as faulty contact by the connector cable impedes communication. Check the connector cable.
- To recover from an error, press the [ENTER/PAUSE] button to display the pause menu, then choose either [CONTINUE] or [STOP]. There may be cases where you can resume operation by selecting [CONTINUE], but because there is a possibility of faulty operation, you should reset the power.

A command that cannot be interpreted occurred in a sequence.

- The remedy is the same as for error 1.

3. Bad Parameter

The value of a specified parameter for a command sent from the computer exceeded the permitted value.

- This occurs when a program setting is not matched to the machine. Check the program's settings for the model and the like.
- This occurs when the machine receives a command that attempts to lower the Z axis to a position that exceeds the machine's cutting range. Check the cutting parameters and the Z0 position.
- This may also be displayed when a problem such as faulty contact by the connector cable impedes communication. Check the connector cable.
- To recover from an error, press the [ENTER/PAUSE] button to display the pause menu, then choose either [CONTINUE] or [STOP]. There may be cases where you can resume operation by selecting [CONTINUE], but because there is a possibility of faulty operation, you should reset the power.

A command that cannot be interpreted occurred in a sequence.

- The remedy is the same as for error 1.

4. I/O Err: Output Request Overlap

An output request command was received before execution of another output request command ended.

- This is an error associated with a device control command.
- This occurs when a program setting is not matched to the machine. Check the program's settings for the model and the like.
- To recover from an error, press the [ENTER/PAUSE] button to display the pause menu, then choose either [CONTINUE] or [STOP].

5. I/O Err: Command Not Recognized

A device control command that could not be interpreted was received from the computer.

- The remedy is the same as for error 1.

6. I/O Err: Framing/Parity Error

Signals sent to the serial connector cannot be received correctly because the communication parameters are unsuitable.

- Make sure the serial communication parameters for the machine and the computer (the settings for the baud rate, parity, number of stop bits, and data bit length) match.
- If you're using a serial connection, this error message may appear when you restart the computer while the machine is turned on. In such cases, either reset the power for the machine or press the [ENTER/PAUSE] button to clear the error.
- To recover from an error, press the [ENTER/PAUSE] button to display the pause menu, then choose either [CONTINUE] or [STOP].

7. I/O Err: Buffer Overflow

The buffer memory became full and data overflow occurred.

- The wiring of the connector cable may not match the machine, or the connector cable may be suffering from a problem such as faulty contact or a broken wire. Check the cable.
- If you're using a serial connection, then also make sure that the communication parameters for the machine (the setting for handshake) match the setting on the computer.
- To recover from an error, press the [ENTER/PAUSE] button to display the pause menu, then choose either [CONTINUE] or [STOP].

8. I/O Err: Indeterminate Error

Another communication-related error occurred.

- A sporadic error caused by noise or the like may have occurred. Reset the power to the machine and the computer.
- The wiring of the connector cable may not match the machine, or the connector cable may be suffering from a problem such as faulty contact or a broken wire. Check the cable. If you're using a serial connection, also make sure the communication parameters for the machine match those for the computer.

9. CAN'T COPY DATA TOO BIG

An attempt was made to use the Copy feature to repeat operations with a set of cutting data larger than 1.9 MB.

- The Copy feature can only repeat operations for a set of cutting data that is 1.9 MB or less. Resend the cutting data from the computer.

10. CAN'T COPY COVER OPEN

An attempt was made to start cutting using the Copy function while the spindle cover was open.

- Cutting cannot be performed while the spindle cover is open. Close the spindle cover, then continue with the operation.

11. CAN'T COPY BUFFER EMPTY

There is no stored data to use for repeating an operation using the Copy feature.

- There is no data in the buffer memory. Resend the cutting data from the computer and execute the Copy function.

12. COVER OPEN

An attempt was made to start cutting while the spindle cover was open.

- Cutting cannot be performed while the spindle cover is open. Close the spindle cover, then continue with the operation.

13. EMERGENCY STOP MOTOR LOCK

Operation stopped because an excessive load was applied.

- Cutting under excessive cutting conditions occurred because the cutter or spindle head struck an obstruction. Turn off the machine, eliminate the cause of the problem, then redo the operation. If this problem occurs frequently, then the spindle unit or the spindle motor may have reached the end of its service life, or the cutter may be worn.
- Rotation of the spindle was obstructed by a large amount of cutting dust inside the nose unit. Remove the nose unit and clean out the cutting dust. If the problem occurs frequently, use an optional vacuum nose adapter.

14. EMERGENCY STOP COVER OPEN

An emergency stop occurred because the spindle cover was opened while a cutting operation was in progress.

- To ensure safety, an emergency stop occurs when the spindle cover is opened while cutting is in progress. Do not open the spindle cover during cutting. Turn off the machine, then redo the operation from the beginning.

15. OPERATING ERROR CAN'T FIND LIMIT

Startup failed because initialization could not be performed at powerup.

- This occurs when initialization at powerup is blocked because of the spindle head striking an obstruction, cutting waste, or the like. Turn off the power. Remove the obstruction and clean the area around the spindle, around the X-axis rail, and inside the X-axis rail. Then turn on the power.

16. Buffer Overflow Can't Insert

The number of steps in the sequence exceeded 1,000.

- The number of steps that you can input using teaching feature is a maximum of 1,000 per sequence. Make sure the number of steps is 1,000 or less.
- The machine displays this, then automatically returns to the original screen.

17. INPUT LABEL NAME

The required label name was not assigned anywhere in the sequence.

- A sequence created with the teaching feature was saved without specifying a label referenced by a command such as [CALL] or [JUMP]. Specify a label name before saving.
- After displaying this message, the machine automatically returns to the seqence editing screen.

18. Can't Find File

There is no existing file to call up.

- An attempt was made to call up an existing file using the teaching menu or [RUN] submenu, but no file has been saved.
- After displaying this message, the machine automatically returns to the original screen.

19. Input File Name

At attempt was made to save a new sequence file without specifying a file name.

- No file name was assigned when an attempt was made to save a sequence created with the teaching feature as a new file. Specify a file name, then repeat the save operation.
- After displaying this message, the machine automatically returns to the original screen.

20. Verify the Card

An attempt was made to access the memory card when no memory card was present.

- This occurs when the memory card is removed during a menu operation that uses the memory card. When inserting or removing a memory card, pause the machine and perform the operation while at the top screen.
- After displaying this message, the machine automatically returns to the previous or original screen.

21. Data Error

A problem was found in a sequence imported from a memory card.

- This occurs when a problem is encountered in the data format of a sequence using the teaching feature. A major cause of this is corruption of the sequence due to a problem with the memory card or the like. Re-create the sequence.
- After displaying this message, the machine automatically returns to the original screen.

22. Memory Write Error

A new sequence could not be created because the memory is full.

- This occurs when the number of sequences that can be saved is exceeded (ten sequences for internal memory, or 512 for a memory card). It also occurs when a memory card does not have enough free space. Take steps such as deleting unneeded sequences, then redo the operation.
- After displaying this message, the machine automatically returns to the original screen.

23. Card Access Error

The memory card was removed while being accessed.

- The memory card was pulled out while it was being accessed. Turn off the machine, then redo the operation from the beginning. When inserting or removing a memory card, pause the machine and perform the operation while at the top screen.

Data could not be written to the memory card.

- This occurs when data could not be saved because the useful life of the memory card has ended or the memory card is damaged. Try formatting the memory card. Alternatively, replace the memory card with a new one.
- After displaying this message, the machine automatically returns to the original screen.

The memory card could not be accessed.

- This occurs when reading and writing are completely impossible because of such reasons as a malfunction in the memory card. Replace the memory card with a new one.
- After displaying this message, the machine automatically returns to the original screen.

Chapter 9
Appendix

9-1 Examples of Settings for Cutting Parameters

Sample Settings for Engraving

This is a suggested guide for cutting parameters. Fine-tuning the settings may be necessary. Adjust these a little at a time as you examine the results, seeking the parameters that best match the workpiece.

	Workpiece	Tool	Spindle speed	Cutting-in depth per pass	XY-axis feed rate	Z-axis feed rate
Engraving	Acrylic resin	ZEC-A4025	20,000 rpm	0.2 mm	15 mm/s	15 mm/s
		ZEC-A4430	20,000 rpm	0.2 mm	15 mm/s	5 mm/s
	Aluminium	ZEC-A4013-BAL	22,000 rpm	0.02 mm	15 mm/s	15 mm/s
		ZDC-A4000	Without rotation	Auto	15 mm/s	15 mm/s
	Brass	ZEC-A4013-BAL	22,000 rpm	0.02 mm	15 mm/s	15 mm/s
		ZDC-A4000	Without rotation	Auto	15 mm/s	15 mm/s
	ABS	ZEC-A4025	20,000 rpm	0.5 mm	20 mm/s	20 mm/s
		ZEC-A4430	20,000 rpm	0.4 mm	15 mm/s	15 mm/s
Cutting out	ABS	ZHS-100	22,000 rpm	0.4 mm	30 mm/s	10 mm/s
		ZHS-200	19,000 rpm	0.4 mm	30 mm/s	10 mm/s
		ZHS-300	16,000 rpm	0.4 mm	30 mm/s	10 mm/s

Tips for Fine-tuning

The optimal cutting parameters are determined by a balance of such factors as the hardness of the material, the feed rate, the spindle rotating speed, the cutting-in depth, and the capacity of the cutter. Refer to the following tips and try fine-tuning the parameters.

Spindle Rotating Speed

In general, faster rotation provides increased cutting capacity. However, a feed rate that is too slow with respect to the spindle speed may lead to melting of the workpiece due to heat, or to increased burring or roughness. Roughness may also occur at some places because feed stops momentarily at places where the direction of engraving changes (that is, at corners). Lower the spindle speed. It may also be a good idea to use faster settings for narrower cutters and slower settings for wider cutters.

Feed Rate

Faster speeds result in shorter cutting times, but the cutting load also increases accordingly. The load may overcome the strength with which the workpiece is secured in place, resulting in crooked lines or a nonuniform cutting-in depth. Also, a feed rate that is too fast for the spindle rotating speed may result in roughness or a raised nap. Lower the feed rate.

Cutting-in Depth

Deeper cutting-in results in a greater cutting load, and roughness becomes more likely. When you make the cutting-in deeper, it is a good idea to raise the spindle speed and lower the feed rate accordingly. Note, however, that there is a limit to the maximum depth. When deep cutting-in is required, it is a good idea to perform double cutting and reduce the amount of cutting-in per pass.

Point

When Good Results Are Not Obtained

☞ See p.124 "Problems with Engraving"

9-2 The Nose Unit

Considerations for Fluctuations in Workpiece Thickness

When you're using a character cutter, it is important to keep the cutting-in depth uniform. Changes in the cutting-in depth alter the line width, affecting the appearance. Materials such as acrylic panels may exhibit variations in thickness or slight curvature. You cannot obtain a uniform cutting-in depth when you engrave these as they are.
When you use the machine's nose unit, the nose tracks the surface of the workpiece and makes it possible to perform engraving at a constant depth at all times without having to give special consideration to variations in thickness.

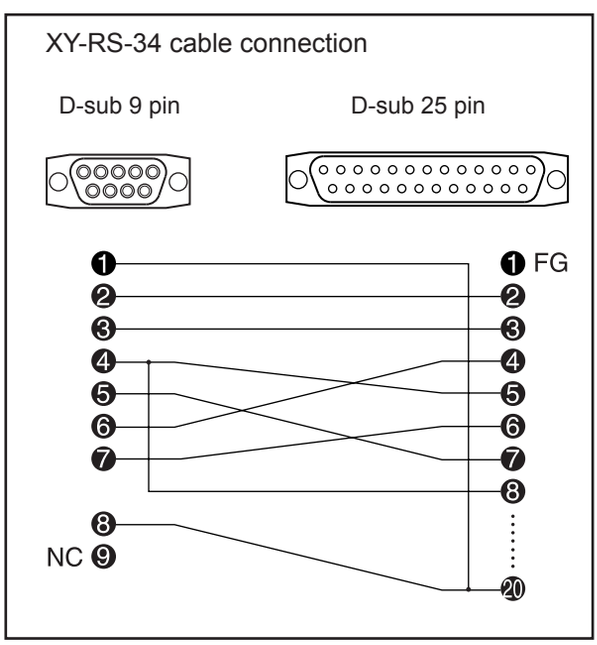
Structure of the Nose Unit

You loosen the lock nut for the spindle when using the nose unit. Loosening the lock nut puts the spindle in a floating state, allowing the entire spindle to move up and down freely. In this state, the nose is pressed against the surface of the workpiece and the spindle is maintained at a constant height from the workpiece surface.
The cutting-in depth is determined mechanically by the amount of extension of the cutter from the nose tip. It is important to note that it is not determined by the vertical movement of the spindle effected by the Z-axis drive motor. The vertical motion due to the Z-axis drive motor is performed simply to press the nose against the workpiece.
The amount of pressure of the nose against the workpiece is determined automatically (when [AUTO Z CONTROL] function is [ON]), and there is no need to set this expressly. The machine detects when the nose tip touches the workpiece and automatically moves the spindle up or down by a suitable distance.

9-3 Optional Items

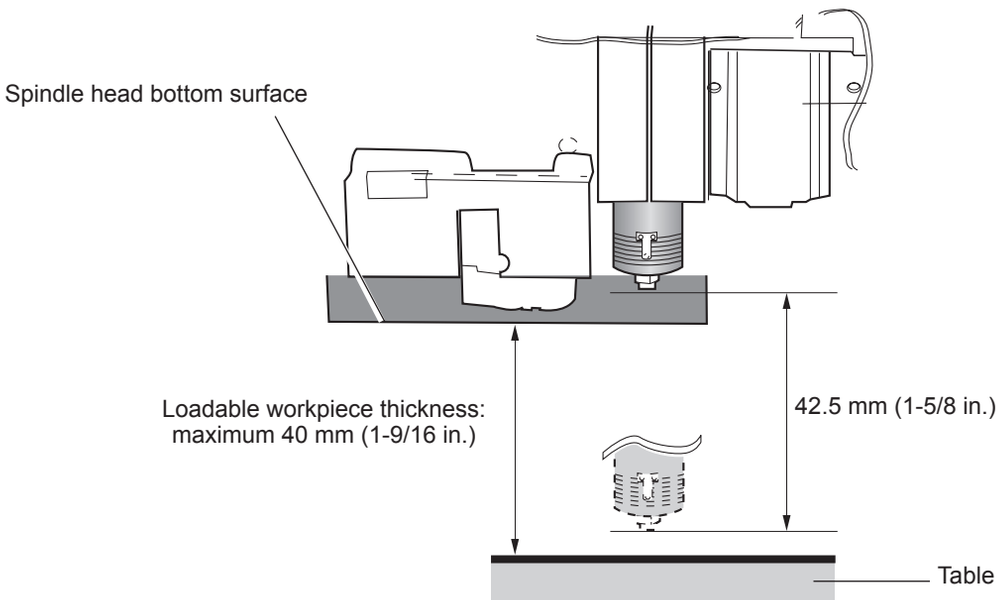
Item	No.	Description
Character cutter (For general use)	ZEC-A4013	4.36 (Dia.) x 165 (L) x 0.127 (W) mm
	ZEC-A4025	4.36 (Dia.) x 165 (L) x 0.254 (W) mm
	ZEC-A4051	4.36 (Dia.) x 165 (L) x 0.508 (W) mm
	ZEC-A4076	4.36 (Dia.) x 165 (L) x 0.762 (W) mm
Character cutter (For aluminum or brass)	ZEC-A4013-BAL	4.36 (Dia.) x 165 (L) x 0.13 (W) mm
	ZEC-A4025-BAL	4.36 (Dia.) x 165 (L) x 0.25 (W) mm
Flat cutter	ZEC-A4150	4.36 (Dia.) x 165 (L) x 1.52 (W) mm
	ZEC-A4190	4.36 (Dia.) x 165 (L) x 1.91 (W) mm
	ZEC-A4230	4.36 (Dia.) x 165 (L) x 2.29 (W) mm
	ZEC-A4320	4.36 (Dia.) x 165 (L) x 3.175 (W) mm
	ZEC-A4380	4.36 (Dia.) x 165 (L) x 3.81 (W) mm
	ZEC-A4430	4.36 (Dia.) x 165 (L) x 4.34 (W) mm
Diamond scraper	ZDC-A4000	4.36 (Dia.) x 178 (L) mm
Collet set	ZC-23	For end mill; Diameter 6, 5, 4, and 3 mm
Adhesive sheet	AS-10	For mounting material; 210 x 140 mm, 10 sheets
Center vice	ZV-600C	
Spindle unit	ZS-600	Replacement spindle unit
Serial cable	XY-RS-34	For IBM AT-compatible personal computer; 3 m

L : Tool length
W : Blade width



9-4 Dimensional Drawings

Cutting Area



9-5 List of Supported Commands

RML-1 Commands

Mode 1

* 1 : $-(2^{23}-1)$ to $+(2^{23}-1)$

Command		Format	Parameter		Range [Default]
@	Input Z1 & Z2	@ Z1, Z2	Z1	Position on Z1	-4250 to 0 [0] 0 to 4250 [0]
H	Home	H	None		
D	Draw	D x1, y1, x2, y2, ... , xn, yn	xn, yn	Absolute coordinate	*1
M	Move	M x1, y1, x2, y2, ... , xn, yn	xn, yn	Absolute coordinate	*1
I	Relative Draw	I △x1, △y1, △x2, △y2, ... , △xn, △yn	△xn, △yn	Relative coordinate	*1
R	Relative Move	R △x1, △y1, △x2, △y2, ... , △xn, △yn	△xn, △yn	Relative coordinate	*1
V	Velocity Z-axis	V f	f	Feed rate for Z axis	0 to 50 [mm/sec] [2 [mm/sec]]
F	Velocity X,Y-axis	F f	f	Feed rate for X and Y axis	0 to 100 [mm/sec] [2 [mm/sec]]
Z	XYZ-axis Simultaneous Feed	Z x1, y1, z1, ... , xn, yn, zn Z x1, y1, z1, ... , xn, yn, zn	xn, yn zn	XY coordinatezn Z coordinate	*1 *1
W	Dwell	W t	t	Dwell time	0 to 32767 [msec] [0 [msec]]
^	Call mode2	^ [mode2] [parameter]..... [parameter] [;]			

Mode 2

Command		Format	Parameter		Range [Default]
DF	Default	DF;	None		
IN	Initialize	IN;	None		
PA	Plot Absolute	PA x1, y1 (,x2, y2, ... , xn, yn); PA;	xn, yn	Absolute XY coordinate	*1
PD	Pen Down	PD x1, y1 (,x2, y2, ... , xn, yn); PD;	xn, yn	XY coordinate	*1
PR	Plot Relative	PR △x1, △y1 (,△x2, △y2, ... , △xn, △yn); PR;	△xn, △yn	Relative XY coordinate	*1
PU	Pen Up	PU x1, y1 (,x2, y2, ... , xn, yn);	xn, yn	Relative XY coordinate	*1
VS	Velocity select	VS s; VS;	s	Feed rate for X and Y axis	0 to 100 [mm/sec] [2 [mm/sec]]

Mode 1 and mode 2 common commands

Command		Format	Parameter		Range [Default]
!DW	Dwell	!DW t [terminator]	t	Dwell time	0 to 32767 [ms] [0 [ms]]
!MC	Motor Control	!MC n [terminator] !MC [terminator]	n	Motor ON/OFF switching	-32768 to 32767 [motor ON]
!NR	Not Ready	!NR [terminator]	None		
!PZ	Set Z1&Z2	!PZ z1 (,z2) [terminator]	z1 z2	Z1 coordinates Z2 coordinates	-4250 to 0 [0] 0 to 4250 [0]
!RC	Revolution	!RC n [terminator]	n	Spindle motor revolution speed	0 to 15, 8000 to 30000 [rpm] [8000 [rpm]]
!VZ	Velocity Select Z-axis	!VZ s [terminator]	s	Feed rate (Z axis)	0 to 50 [mm/sec] [2 [mm/sec]]
!ZM	Z-axis Move	!ZM z [terminator]	z	Z coordinate	-4250 to 0
!ZO	Set Z0	!ZO z [terminator]	z	Z machine coordinate	-4250 to 0
!ZZ	XYZ-axis Simultaneous Feed	!ZZ x1, y1, z1, ..., xn, yn, zn [terminator]	x n , yn zn	XY coordinate Z coordinate	*1 *1

Device Control Commands

The device control commands determine how communication between the machine and the computer will be handled using the RS-232C interface; and also are employed when relaying to the computer the status of the machine.
A device control command is composed of three characters: ESC (1Bh), ".", and an uppercase letter.

<table>
<tr><th>Command</th><th>Format</th><th>Parameter</th><th>Range
([ ] is default)</th><th>Explanation</th></tr>
<tr><td>ESC .E
Output RS-232C Error Code</td><td>[ESC].E</td><td>None</td><td></td><td>Outputs an error code related to RS-232C interface (see the table below), and clears the error simultaneously. At the same time, the error being displayed is canceled
<table>
<tr><th>Error code</th><th>Possible cause and action</th></tr>
<tr><td>0</td><td>No I/O errors</td></tr>
<tr><td>10</td><td>Cause: after execution of an output command, other output commands are sent before the output was not completed.
Action: let the computer to read the machine output by the output command and then send another output command.</td></tr>
<tr><td>11</td><td>Cause: an error occurs in a device control command.
Action: correct your program.</td></tr>
<tr><td>13</td><td>Cause: parameters are overflowing.
Action: correct your program.</td></tr>
<tr><td>14</td><td>Cause: the number of the parameters set is more than specified or a colon ':' was not used to terminate.
Action: correct your program.</td></tr>
<tr><td>15</td><td>Cause: framing error, parity error or overrun
error at the time of data receipt .
Action: match the communication protocols of both computer and the machine (baud rate, data bit length, stop bit length).</td></tr>
<tr><td>16</td><td>Cause: the I/O buffer overflows.
Action: Make sure the handshake setting matches.</td></tr>
</table></td></tr>
<tr><td>ESC .K
Abort RML-1 Command</td><td>[ESC].K</td><td>None</td><td></td><td>Continues to execute the RML-1 command in operation, aborts other incoming RML-1 commands and clears the data buffer.</td></tr>
</table>

9-6 Specifications

Main Unit Specifications

	EGX-600	EGX-400
Table type	T slot	
Table size	610 (W) x 407 (D) mm (24 (W) x 16 (D) in.)	407 (W) x 305 (D) mm (16 (W) x 12 (D) in.)
Cutting area	610 (X) x 407 (Y) x 42.5 (Z) mm (24 (X) x 16 (Y) x 1-5/8 (Z) in.)	407 (X) x 305 (Y) x 42.5 (Z) mm (16 (X) x 12 (Y) x 1-5/8 (Z) in.)
Loadable workpiece thickness	Maximum 40 mm (1-9/16 in.)	
XYZ-axis motor	AC servo motors (DAC-FFP), 3-axis simultaneous control	
Feed rate	XY-axis: 0.5, 1 to 100 mm/s (0.02 in./s, 0.039 to 3.9 in./s) Z-axis: 0.5, 1 to 50 mm/s (0.02 in./s, 0.039 to 1.9 in./s)	
Acceleration	0.1 G, 0.05 G	
Software resolution	0.01 mm/step (0.00039 in./step)	
Mechanical resolution	XY-axis: 0.003 mm/step (0.00012 in./step) Z-axis: 0.0025 mm/step (0.000098 in./step)	
Spindle motor	DC brushless motor, Maximum 72 W	
Spindle speed	8,000 to 30,000 rpm	
Tool chuck	Cutter holder (4.36 mm) and collet	
Positioning Accuracy	± 0.1 % of distance traveled or ± 0.1 mm (± 0.004 in.), whichever is greater (no-load operation)	
Repeatability	0.05 mm (0.002 in.) or less	
Display	LCD panel with backlight	
Buttons and Controls	Menu button, ENTER/PAUSE button, Spindle button, X/Y-axis Origin Set button, Z-axis Origin Set button, Movement buttons, Z-axis Movement buttons, Feed button, Copy button, and dial	
Interface	Parallel connector (Centronics-compliant), serial connector (RS-232C-compliant), Memory card slot (Compliance with Multi Media Card), expansion connector 1, expansion connector 2	
Buffer memory	2MB (replot buffer: 1.9MB)	
Instruction system	RML-1 (mode 1, mode 2)	
Power supply	AC 117 V, 230 V, 240 V ± 10 %, 50/60 Hz	
Power consumption	3.5 A at 117 V, 1.6 A at 230 V, 1.6 A at 240 V	
Acoustic noise level	No-load operation: 75 dB (A) or less standby: 45 dB (A) or less (According to ISO 7779)	
Dimensions (main unit)	995 (W) x 820 (D) x 521 (H) mm (39-3/16 (W) x 32-5/16 (D) x 20-1/2 (H) in.)	795 (W) x 719 (D) x 521 (H) mm (31-5/16 (W) x 28-5/16 (D) x 20-1/2 (H) in.)
Weight (main unit)	64 kg (141 lb.)	51 kg (112 lb.)
Packed dimensions	1100 (W)× 940 (D)× 690 (H) mm (43-5/16 (W) x 37 (D) x 27-3/16 (H) in.)	866 (W)× 910 (D)× 690 (H) mm (34-1/8 (W) x 35-13/16 (D) x 27-3/16 (H) in.)
Packed weight	81 kg (180 lb.)	64 kg (141 lb.)
Operating environment	Temperature: 5 to 40˚C (41 to 104˚F) humidity: 35 to 80 % (no condensation)	
Accessories	Operation panel, operation-panel connector cable, power cord, depth regulator nose unit, solid collet, solid collet for diamond scrapers, clamps, wrenches (17 mm, 10 mm), hexagonal screw driver, hexagonal wrench, Roland Software Package CD-ROM, user's Manual	

Interface Specifications

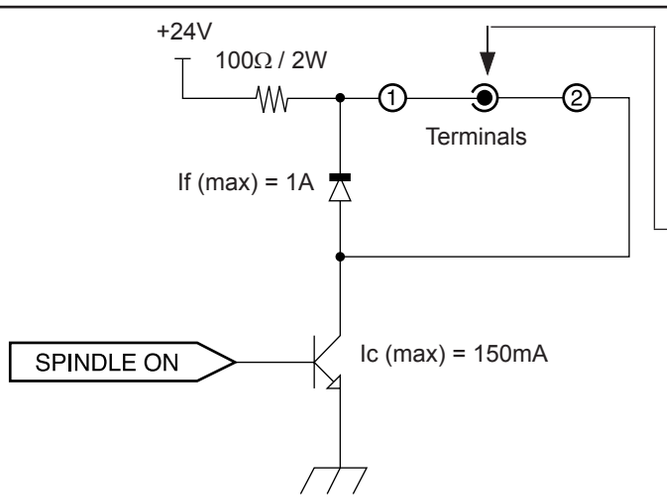
Parallel Connector

Standard	In compliance with the specification of Centronics
Input signal	$\overline{\text{STROBE}}$ (1BIT), DATA (8BIT)
Output signal	BUSY (1BIT), $\overline{\text{ACK}}$ (1BIT)
I/O signal level	TTL level
Transmission method	Asynchronous

Serial Connector

Standard	RS-232C specification
Transmission method	Asynchronous, duplex data transmission
Transmission speed	4800, 9600, 19200, 38400
Parity check	Odd, Even, None
Data bits	7 or 8 bits
Stop bits	1 or 2 bits
Handshake	Hardware or Xon/Xoff

Expansion Connector 1

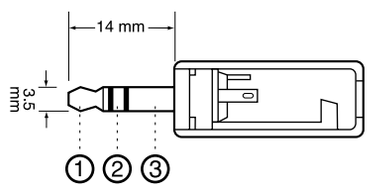


This circuit is activated when the spindle motor is in operation.

Notice

- Use within the rated range shown above.
- Do not apply voltage greater than 24 V to the terminal.
- Do not short the terminal to ground.

Compatible plug



Use only a triple-contact plug of the size described above.

Notice

Do not use terminal ③. Use only terminals ①and ②.

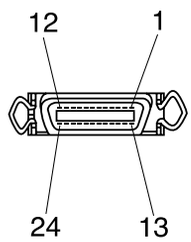
No responsible is assumed for effects to which any equipment connected to this external output connector is subjected.

Expansion Connector 2

This connector is for input and output with external equipment. It is used in combination with the teaching feature. It makes it possible to control the machine using signals from an external device and to send signals from the machine to an external device with specified timing. For information about how to perform control using expansion connector 2, refer to "Chapter 4 The Teaching Feature."

Pin Connections

Terminal No.	Signal	Terminal No.	Signal	Pin connections
1	PW	13	PG	
2	PW	14	PG	
3	IN 8 (Input port 8)	15	OUT 8 (Output port 8)	
4	IN 7 (Input port 7)	16	OUT 7 (Output port 7)	
5	IN 6 (Input port 6)	17	OUT 6 (Output port 6)	
6	IN 5 (Input port 5)	18	OUT 5 (Output port 5)	
7	IN 4 (Input port 4)	19	OUT 4 (Output port 4)	
8	IN 3 (Input port 3)	20	OUT 3 (Output port 3)	
9	IN 2 (Input port 2)	21	OUT 2 (Output port 2)	
10	IN 1 (Input port 1)	22	OUT 1 (Output port 1)	
11	NC	23	NC	
12	NC	24	NC	

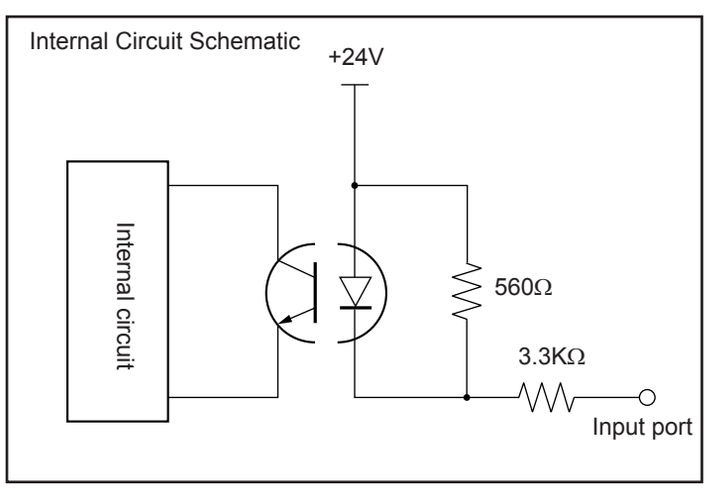


Amphenol 24 pin

* No responsible is assumed for effects to which any equipment connected to this external output connector is subjected.

Input Port Specifications (IN1 to IN8)

Number of input ports: 8
Input voltage: DC 24 V
Input current: 7 mA
Insulation method: Isolated photocoupler
Compatible connector: Sink-mode output

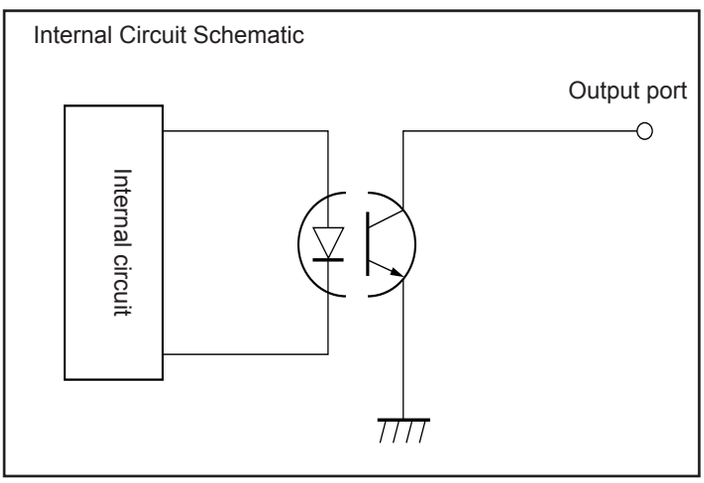


Notice

The outputs connected to the input ports are assumed to be contactless outputs such as transistors. When you are making connections that use mechanical contact (such as switches or relays), use microcurrent devices.
Ensure that the leakage current when a contactless circuit connected to the input ports is off is 1 mA or less per input port.

Output Port Specifications (OUT1 to OUT8)

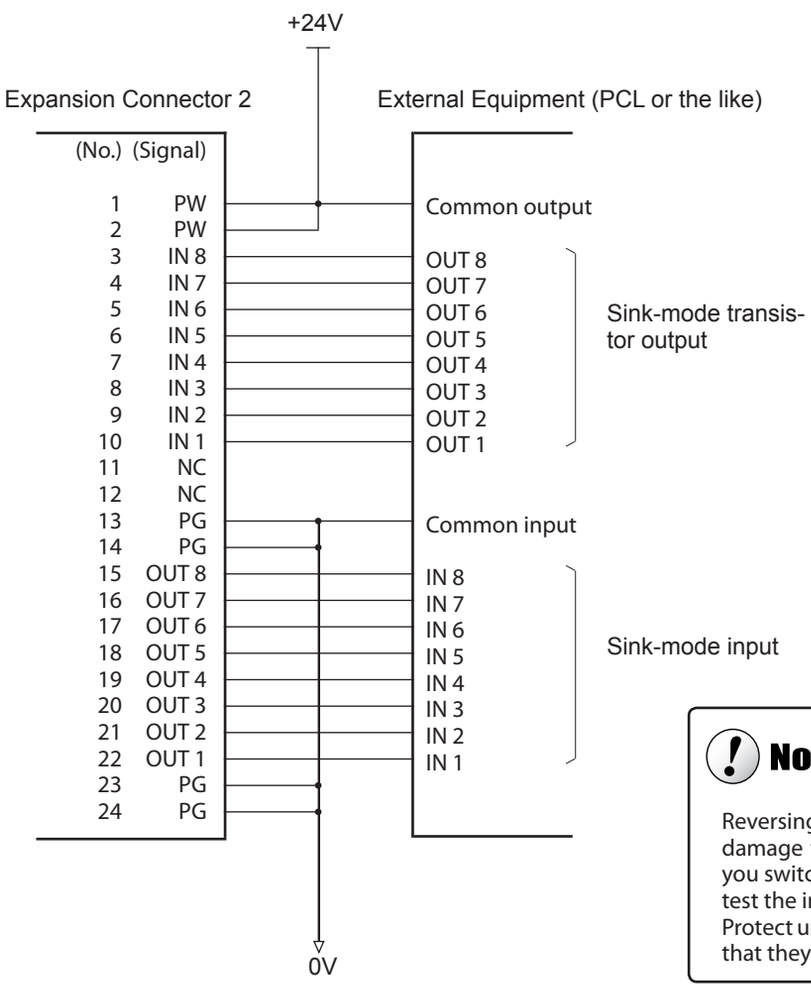
Number of output ports: 8 (sink-mode output)
Rated load voltage: DC 24 V
Maximum load current: 20 mA per port
Leakage current: 0.1 mA or less
Insulation method: Isolated photocoupler
Compatible connector: External-device input



Notice

Do not apply loads greater than the foregoing to the output ports.
The output ports are assumed to be connected to loads such as transistors. When they are connected to an inductive load such as a relay, be sure to connect a protect diode to the coil to absorb counterelectro-motive force. Improper connection may damage the circuit.

Example of Connection to External Equipment



Notice

Reversing the polarity of the power source may damage the circuit. Be sure to check this before you switch on the power. Also, do not attempt to test the insulation.
Protect unused and never-connected (NC) pins so that they do not accidentally short to other pins.

For China

产品中有毒有害物质或元素的名称及含量

部件名称	有毒有害物质或元素					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬(Cr(VI))	多溴联苯(PBB)	多溴二苯醚(PBDE)
印刷电路板	×	○	×	○	○	○
头部	×	○	○	○	○	○
壳体、底架	×	○	○	○	○	○
电源	×	○	×	○	○	○
其他（电缆、附件等）	×	○	○	○	○	○

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